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Distribution and Zoogeography of Peruvian Bats, with Comments on Natural History

MERLIN D. TUTTLE

ABSTRACT

Biological data are presented for 54 species of bats collected in 1963 and 1964, and zoogeographic problems are discussed. A list of Peruvian bats, based on specimens examined and those reported in the literature, is presented. Previously unreported specimens contained in the collections of the American Museum of Natural History, the Field Museum of Natural History, and the United States National Museum are included. Some erroneous records are clarified. Five genera and 16 species of bats are reported from Perú for the first time.

INTRODUCTION

Owing to its strikingly diverse physiography, Perú is inhabited by an unusually rich and somewhat peculiar chiropteran fauna. The purpose of this paper is to summarize the current state of knowledge concerning the distribution and biology of the 105 species of bats known from that country. Due to the paucity of information available, it may be assumed that future collecting will reveal the presence of many additional species. Since Tschudi's 1844 work on the fauna of Perú, there have been only a few contributors to knowledge of Peruvian bats. Aellen (1965) reported on a collection from northwestern Perú containing 27 specimens of seven species; Sanborn (1932a and elsewhere) and Thomas (1893 and elsewhere) reported mostly on small local collections from the Amazon region. The only monographic study of Peruvian bats (de la Puente, 1951) was geographically restricted to the area near Lima on the west coast. Most of the earlier collections of bats were made by natives hired to make general collections of mammals. Modern collecting techniques such as the use of mist nets were then unknown. Thus, it must be assumed that many species have escaped notice, even in the areas where collecting has been most intense.

In the course of extensive field investigations sponsored by Andrews University in 1964, more than 1300 bats were collected in central Perú. Among these were three genera and 13 species previously unreported from the country. Other bats, known previously from one or two Peruvian localities, were found to be more widely distributed within the country. In evaluating these records, I have perused literature pertaining to Perú and have examined specimens, some unreported, in several North American collections.

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METHODS AND MATERIALS

This paper is based principally upon collections made in central Perú by me in June, 1963, by members of the Andrews University Department of Biology working with me in June and July, 1964, and by my brother, Arden L. Tuttle, in August, 1964. In addition, specimens were examined in the collections of the American Museum of Natural History (AMNH), Field Museum of Natural History (FMNH), and United States National Museum (USNM).

Reproductive and other biological data, even for the most common of Peruvian bats, are few. For this reason, I have included as much information as possible on habitats and reproduction; all such data were obtained by personal observation or by other members of our field party.

All measurements are given in millimeters and weights are in grams. Measurements of the forearm represent the longest measurable distance between the wrist and the elbow with wing fully flexed and dry. Crown-rump length of embryos was measured from the crown to the most distant point on the rump as the embryo normally rests within the uterine sac, and

includes the sac. All pregnant females had but a single embryo unless otherwise noted. No attempt was made to measure more than a sample of the embryos or testes of common species. Both the length (given first) and the width of the testes were measured, and are not recorded for juveniles. Considerable individual variation, the significance of which is not known, will be noted with respect to measurements of testes of adult males.

South American maps often disagree concerning boundaries and spellings of place-names. Consequently, all boundary lines and names of localities are given according to the "Map of Hispanic America" (published by the American Geographical Society), excepting boundaries for the Departamento de Pasco, which did not exist until 27 November 1944 when northern Junín and southern Huánuco were joined to form a new department. In some instances it was advisable to correct slight misspellings (indicated by brackets). Unfortunately, the names of provinces and departments (see Fig. 1) seldom have been included in locality records. Most authors have, however, mentioned larger towns and rivers in conjunction with collection sites, thus making it possible to determine provincial and departmental designations with minimal error. Locality names not included on the "Map of Hispanic America" series (and the accompanying gazetteer, "Geographical names in Ecuador and Peru," 1944), published by the American Geographical Society, are indicated by an asterisk. When it was impossible to substantiate the exact location of an important distributional record, an appropriate explanation is included.

The reported distribution of each species of bat known to inhabit Perú is given (from the northernmost locality to the southernmost) and substantiated by literature citations or museum specimens. Only marginal records are given for common species. Until revisionary works now in progress are completed, or until additional specimens are available, the classification, especially at the infraspecific level, of several species will remain in question. For this reason, I have used only specific names although I have made mention, where appropriate, of subspecific names that have been used with reference to Perú. Nomenclature follows Cabrera (1958) unless a more recent work is cited.

Specimens that my colleagues and I collected in 1963 and 1964 are deposited in the American Museum of Natural History unless otherwise indicated. A brief description of sites at which collections were made in those two years follows the accounts of species.

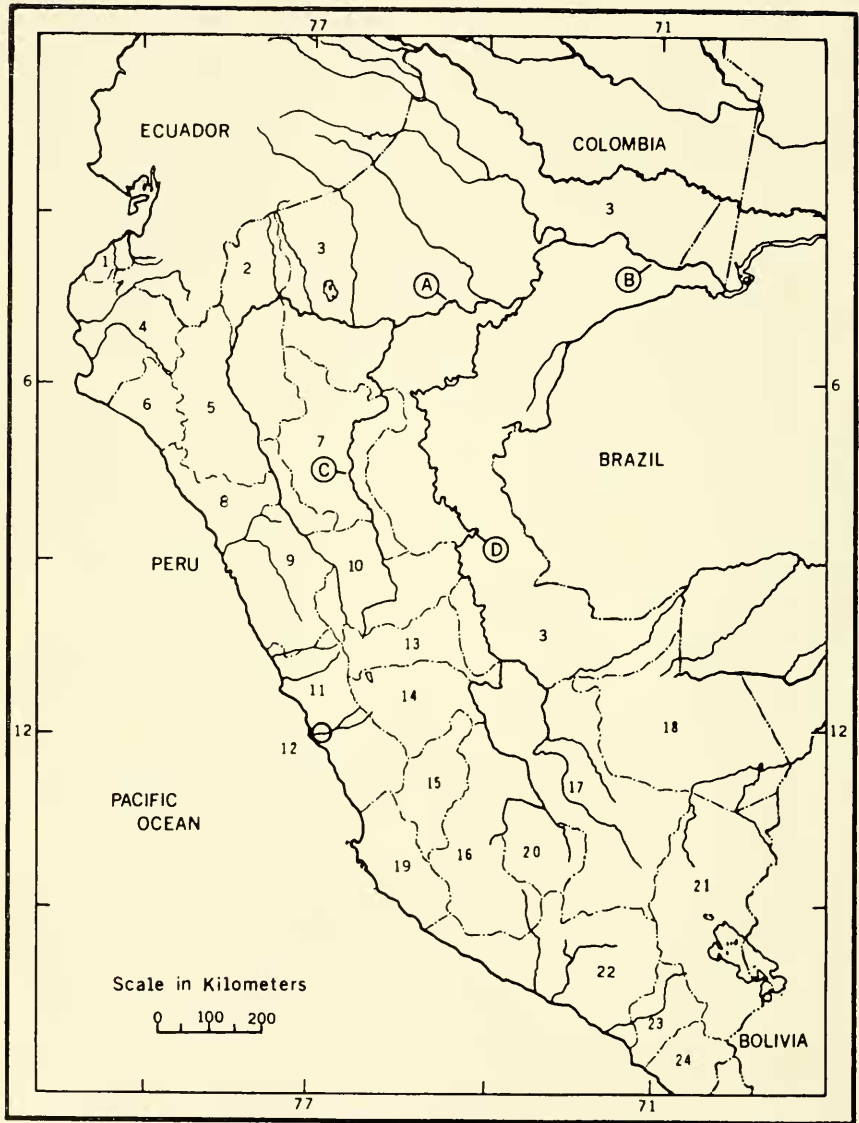


FIG. 1. Map of Perú indicating department boundaries and major river systems. Departments are numbered as follows: 1, Tumbes; 2, Amazonas; 3, Loreto; 4, Piura; 5, Cajamarca; 6, Lambayeque; 7, San Martín; 8, La Libertad; 9, Ancash; 10, Huánuco; 11, Lima; 12, Callao; 13, Pasco; 14, Junín; 15, Huancavelica; 16, Ayacucho; 17, Cuzco; 18, Madre de Dios; 19, Ica; 20, Apurímac; 21, Puno; 22, Arequipa; 23, Moquegua; 24, Tacna. Rivers are labeled as follows: A, Marañón; B, Amazonas; C, Huallaga; D, Ucayali.

ENVIRONMENT OF PERU

GEOLOGICAL HISTORY

The Andes have been of prime importance in determining the climate and distribution of life in Perú. An Andean uplift of between 5000 and 10,000 feet is thought to have occurred during Tertiary time, followed by an additional uplift of 200 to 1200 feet in the Quaternary (Bosworth, 1922:157; Garner, 1959). Prior to the first uplift, southern Perú apparently underwent a long period of erosion in the east, whereas parts of the west were covered with great lava sheets. In central and northern Perú, a relatively moist climate probably supported mesophytic vegetation until the Andean uplift imposed an arid climate and accompanying xerophytic plant life on the coastal region (Ogilvie, 1922:13, 109).

Pleistocene glaciation was widespread in the Peruvian Andes (McLaughlin, 1924; Douglas, 1933:315-316) and, according to Bowman (1916:214), "some of the glaciers were over a thousand feet thick; a few were nearly two thousand feet thick, and the cirques that fed them held snow and ice at least a half mile deep." Bowman suggested that, in many places in eastern Perú, glaciers 5-10 miles long may have extended nearly to the tree line at elevations of about 10,000 feet. On the southwestern slope of the Andes, Fenner (1948) reported that some glaciers may have descended to 12,800 feet and possibly in rare instances to 10,980 feet, but that 14,000 feet was the common lower limit. In the central Peruvian Andes, Harrison (1943) found evidence that glaciers had descended to about 13,500 feet on the western side and to less than 12,000 feet on the eastern side. Morains and other deposits have been interpreted to indicate three distinct stages of Pleistocene glaciation (McLaughlin, 1924).

Clastic material deposited in Andean valleys indicates that the Pleistocene climate was one of alternating periods of aridity and humidity both to the east and west of the mountains, but aridity and deposition apparently dominated in the west, and humidity and incision in the east (Garner, 1959). Extensive erosion cut steep, cliff-walled canyons and gorges, as much as 7000 feet deep (Johnson and Platt, 1930:26), especially on the eastern slope where precipitation was heaviest (Ogilvie, 1922:14). At the base of the Andes, enormous alluvial fans partly filled the valleys (Bowman, 1916:70) and spread outward onto the plains.

The coastal plain or "littoral" region of northwestern Perú forms a desert 10-20 miles wide between the Pacific Ocean and the Andes. A great submarine fault-scarp marks a main fracture along the coast; it has been suggested that at this fracture the "littoral" has been lowered and raised repeatedly during the Quaternary. The overall trend, however, was a gradual process of uplift (Bosworth, 1922:194-196). The littoral region is

rugged and much dissected, although elevations usually are well below 1000 feet. Large areas of tablelands, known as "tablazos," consist of thin sheets of Quaternary marine sediments lying horizontally over upturned Tertiary rocks. The "tablazos" cover most of the littoral zone from the mountains to the sea.

It is clear that the littoral region was better watered at times during the Pleistocene than at present. Lemon and Churcher (1961) noted that "the vertebrate fauna found in the tar seep deposits [at Talara] include many forms characteristic of a habitat considerably wetter than any found in the area at the present day. Although it is not possible to say that the whole region was well watered during Pleistocene times, there must have been numerous permanent or semi-permanent streams." This also is indicated by an abundance of vegetable material in the tar seeps and by the deep river valleys that have been cut into the elevated marine terraces. The local coastal climate probably differed little from that of the present (Lemon and Churcher, 1961). Thus, it must be assumed that runoff from the high Andes was much greater in the Pleistocene than now.

East of the Andes much of the geological record is buried beneath enormous alluvial deposits and the dense jungle vegetation of Amazonas, and little precise information is available for this region.

CLIMATE

Perú is roughly divisible into three climatic regions: Pacific coastal, high Andean, and Amazonian. These are characterized by desert, semidesert, and tropical rainforest climates, respectively. Winter comes in June or July, and the rainy season is approximately from November to March. There is about a 10-degree decrease in mean annual temperature from north to south due to latitude (Ogilvie, 1922:28).

The Pacific coastal plain is characterized by a sudden change from excessive to scanty rainfall. The north side of the Gulf of Guayaquil receives 1000 mm of rain annually, whereas Tumbes on the south side receives only about 250 mm (Kendrew, 1953:478). Farther south, rain falls rarely and the only moisture, other than that from widely scattered rivers, comes to the coastal hills or "lomas" and is derived from fog banks that are prevalent in winter. Between the coastal hills and the Andes lies an extensive belt of essentially moistureless desert where the only notable life is restricted to river valleys.

The highland climate is characterized by low precipitation, a great daily range of temperature, and a high percentage of clear days, promoting rapid heating by day and cooling by night (Ogilvie, 1922:16). Whereas precipitation occurs almost daily in the highest parts of the northern Andes, it decreases rapidly toward the south (Ogilvie, 1922:28).

Most of the precipitation east of the Andes is derived ultimately from the Atlantic Ocean. Excessive rainfall there is due to the orographic influence of the Andes upon trade winds as they are forced up the eastern slopes (Kendrew, 1953:479). The belt of maximum precipitation lies between 4000 and 10,000 feet (Bowman, 1916:147), but rainfall is heavy throughout the whole Amazonas region. Tingo Maria, in the central Amazonas, receives an annual mean rainfall of 3192.6 mm (World weather records, 1966:150).

PHYSIOGRAPHY AND VEGETATION

Ecologically, Perú is one of the most diverse and complicated countries of the world. It comprises approximately 1,285,215 square kilometers in which Tosi (1960) has mapped the geographic distribution of 35 different vegetative formations.

The Andean Cordillera forms the backbone of Perú and divides the country into three general regions: (1) desert coast and piedmont on the west, an arid strip 10-100 miles wide; (2) the sierra, a series of high mountain chains with their peaks, plateaus, and valleys; and (3) the montaña, which is the hot, humid, low country east and northeast of the Andes, consisting of foothills and true Amazonian lowland.

A further division into six general physiographic regions has been described by Ogilvie (1922:29) as follows: (1) coastal hills with moisture and vegetation in winter; (2) desert piedmont with oases in some of the valleys; (3) the Puna (high, dry, unforested cordillera with intermontane basins in the south); (4) the Altiplano with moisture and forest; (5) broken mountain slopes (moist and forested); and (6) plains (hot, moist, and mostly forested).

The Pacific seaboard is largely desert where, for long stretches between valleys, there is little evidence of life and no water (Ogilvie, 1922:20). In the north (north of Chiclayo), runoff from the Andes and frequent fog permit the growth of dry forest along the western slopes, and in the southeastern section of Departamento de Tumbes there is even a small area of humid forest. South of Chiclayo the dry forest quickly narrows, and beyond Trujillo the forest is broken and confined to widely separated river valleys (Tosi, 1960: maps 1-2). For the most part, southwestern Perú forms one of the world's most extreme deserts. The natural vegetation of the river valleys "includes trees—the *chanar* (*Gourleja decorticans*), the *molle* or pepper (*Schinus molle*), and a willow (*Salix Humboldtiana*)—as well as a number of shrubs" (Ogilvie, 1922:112).

On the western slopes of the Andes the piedmont desert gradually gives way to the semidesert, treeless grassland that is typical of most of the high Andes. The high grassland between the Cordillera Occidental and the Cordillera Oriental, the eastern slope of which overlooks the Amazonian

plains, is known as the "Puna" (Ogilvie, 1922:115). Summer and winter bring little change to the natural vegetation of this area. Rains that come from January to March simply allow the cover to become a little thicker and the grasses to lose some of their burnt appearance (Ogilvie, 1922:117).

On the eastern slopes of the Andes, meadows give way to dense, low forest, "Ceja de la Montaña," at elevations between approximately 9800 and 11,400 feet. Dense "eyebrow" forest covers most of the steep ridges and valleys, and taller "montaña" forest grows on the lower slopes and flat valley bottoms. "Eyebrow" and "montaña" gradually merge at approximately 3900 feet elevation (Ogilvie, 1922:119). Tree lines and vegetational types vary with topography and latitude. Arid regions occur in some of the eastern valleys due to the effects of rain shadows. The most extensive of these occurs along the Alto Río Marañón.

The hot, humid forest of the low country east and northeast of the Andes spreads eastward across the foothills into the true Amazonian lowland. This forest is characterized by tall trees with buttressed trunks, a dense, high canopy, and sparse undergrowth (Ogilvie, 1922:121).

ZOOGEOGRAPHIC COMMENTS

Few, if any, Peruvian localities have been collected adequately, and the relatively small number of bats available from Perú and critical adjacent areas does not warrant more than a preliminary zoogeographic discussion. The Amazonas region has attracted greatest attention, because of its faunal diversity, whereas the higher elevations of the Andes and the west coast have been largely neglected.

The physiographic and altitudinal distribution of Peruvian bats (based only on current records) is summarized in Tables 1 and 2. Further collecting undoubtedly will reveal wider distributions for some species presently known only from one or a few localities. The geographic distribution of bats in Perú is restricted primarily by a combination of extreme habitat differences and by the height and width of the Andean Cordillera. Distributional records indicate that 83 species are restricted to areas east of the Andes; 19 species occur on both sides. Three species and three subspecies (*Lonchophylla hesperia*, *Tomopeas ravus*, *Promops davisoni*, *Myotis nigricans nicholsoni*, *Molossus molossus daulensis*, *Eumops auripendulus auripendulus*) are restricted to west of the Andes.

It seems possible to divide Peruvian bats into three general categories: (1) those limited primarily to rainforest; (2) those restricted primarily to areas lacking rainforest (arid desert to savannah and dry forest); (3) widespread species not restricted to the two categories first listed. In the following discussion, bats are referred to as "rainforest," "non-rainforest," and "widespread" species, respectively.

TABLE 1. Approximate physiographic and altitudinal distribution of the 101 species of Peruvian bats known from east of the Andes based on locality records. Numbers in parentheses are number of species.

Taxa	Broken mountain slopes,			
	Amazon plains and foothills to 3000 ft	3000 to 6500 ft	6500 to 10,000 ft	above 10,000 ft
Emballonuridae	(1)			
	(8)			
Noctilionidae	(2)			
Phyllostomatidae				
Chilonycterinae	(2)			
Phyllostomatinae	(15)			
Glossophaginae		(2)		
	(1)			
	(8)			
		(1)		
Carollinae	(1)			
	(3)			
		(1)		
Sturnirinae		(2)		
	(4)			
Stenoderminae		(1)		
	(2)			
	(13)		(1)	
Desmodontidae		(1)	(1)	
		(1)		
	(1)			
Furipteridae	(1)			
		(1)		
Thyropteridae	(2)			
Vespertilionidae			(3)	
		(2)		
	(1)			
	(5)			
			(1)	
Molossidae		(1)		
	(3)			
	(8)			
		(1)		

Of the 23 species recorded from west of the Andean Cordillera, present distributional knowledge indicates that 13 (including three, *Glossophaga soricina*, *Myotis nigricans*, and *Molossus molossus*, which have distinctive subspecies east and west of the Andes that are adapted to rainforest and non-rainforest environments, respectively) are widespread, six fall in the second category above, and four are rainforest species (see Table 3). The four mentioned last all are frugivorous and are known in western Perú only from the forested northwestern tip, whereas the insect-, nectar-, and blood-feeders are much more widely distributed. The 13 widespread species are insectivorous (10), nectivorous (2), or sanguivorous (1). The latter, the vampire

bat (*Desmodus rotundus*), is probably the most diverse, ecologically, of all Peruvian bats. In the arid west, where it can subsist on the blood of sea birds, it often occupies areas that are completely devoid of either fresh water or vegetation. Among the six non-rainforest species, four are insectivorous, and two are nectivorous.

In winter, there is sufficient moisture along the coastal hills or "lomas" to support a large variety of flowering plants (Ogilvie, 1922:111). This provides the possibility of dispersal of nectar- and insect-eating bats between river valley oases. When the dew fails at the end of winter, the hills dry up and the plants wither or die within a short time, leaving only the river valleys habitable for most animal life. Even in these valleys there are no dependable sources of food for bats that are unable to subsist on nectar, insects, or blood.

Of the six non-rainforest species that occur in the Pacific arid regions of Perú and Ecuador, three (*Platulina genovensium*, *Amorphochilus schnablii*, and *Eptesicus innoxius*) are found east as well as west of the Andean Cordillera. East of the Cordillera these bats (except for *E. innoxius*, recorded only from Argentina in the east) are restricted to valleys, such as the Marañón, where rain shadows impose xeric conditions. The apparent absence of *Lonchophylla hesperia*, *Tomopeas rarus*, *Myotis nigricans nicholsoni*, and *Molossus molossus daulensis* east of the Andes may be actual or simply an artifact of inadequate collecting.

The trans-Andean distribution of at least 50 percent of the non-rainforest bat fauna of Perú, as well as the distribution of rainforest and widespread species, clearly implies the presence of a trans-Andean dispersal route in northern Perú. Furthermore, the amount of divergence found in related populations east and west of the Andes suggests varying degrees of isolation, due to a filtering effect.

After noting the distributional evidence for trans-Andean dispersal, I found that there were two trans-Andean passes of approximately 7000 to 8000 feet elevation near the Ecuadorian border of Perú and learned that these passes are thought to have been of major importance in determining the present distribution of both birds (Chapman, 1926; Haffer, 1967*a,b,c*) and reptiles (Schmidt and Walker, 1943).

One pass is located between the headwaters of the Río Piura and Río Huancabamba. A bat crossing this pass would have to travel six miles at elevations between 5000 and 6500 feet and about four miles at approximately 7000 feet. The other is located between the headwaters of the Río Chotano and Río Chancay; a bat crossing it would have to traverse 30 miles of elevations between 5000 and 6500 feet and three miles between approximately 6500 and 8000 feet. Low, xeric forest occurs in both passes and along the adjoining river valleys (Tosi, 1960).

TABLE 2. Approximate physiographic and altitudinal distribution of Peruvian bats in high Andes (2 species) and west of Andes (21 species) based on locality records.

Taxa	Altiplano	Puna	NW forest	Arid regions, sea level to above 10,000 ft		
				Oases in coastal desert	3000 to 10,000 ft	above 10,000 ft
Emballonuridae		—(1) ¹ —				
Phyllosomatidae						
Glossophaginae				—(1)—		
				—(3)—		
Stenoderminae			—(4)—			
Desmodontidae				—(1)—		
Furipteridae				—(1)—		
Vespertilionidae	—(1) ² —				—(2)—	
				—(1)—		
				—(2)—		
Molossidae				—(6)—		

¹ *Centronycteris maximiliani* was reported from the high plains of Perú; no specific locality was given, and this record is in doubt.

² *Histiotus macrotus* has been reported from the low west coast as well as from near Lake Titicaca.

Either of these passes could be crossed easily in a single night, and several species of bats are probably at least seasonal residents in these passes. Of the 19 species known to occur both east and west of the Andes, eight already have been recorded from elevations of at least 6000 feet or higher, and there is little reason to doubt that others might move through the passes also. Bats such as *Anoura geoffroyi*, *Desmodus rotundus*, *Myotis chiloensis*, and *Lasiurus borealis* probably could disperse through the northern passes without hinderance and may be able to cross in other areas as far south as the Departamento de Cajamarca. South of there, the Andes increase greatly in both width and height and cannot be crossed at elevations below about 15,000 feet.

Uplift of the Andes severed the once continuous area of humid tropics in South America, leaving it in two disconnected areas. The pass in northern Perú formed by the headwaters of the Río Piura and the Río Huancabamba is the lowest pass between Amazonian and Pacific drainage in the entire Andean system from southern Chile to eastern Colombia, and, according to Chapman (1926:34, 44, 129-130), there probably is no interchange of tropical or subtropical life, direct or indirect, between the two divisions except for movement through the two northern Peruvian passes (mentioned above) and that at Andalucia in eastern Colombia. It is conceivable that such a high-elevation species as *Anoura geoffroyi* could occasionally cross the Andes through higher passes between northern Perú and eastern Colombia, but,

TABLE 3. Ecologic affinities of bats known from west of the Andean Cordillera in Peru.

Rainforest	Non-rainforest	Widespread
<i>Uroderma bilobatum</i>	<i>Lonchophylla hesperia</i>	<i>Glossophaga soricina</i>
<i>Vampyrops vittatus</i>	<i>Platalina genovensium</i>	<i>Anoura geoffroyi</i>
<i>Vampyrops helleri</i>	<i>Amorphochilus schnablii</i>	<i>Desmodus rotundus</i>
<i>Artibeus jamaicensis</i>	<i>Eptesicus innoxius</i>	<i>Myotis chilensis</i>
	<i>Tomopeas rarus</i>	<i>Myotis nigricans</i>
	<i>Promops davisoni</i>	<i>Histiotus macrotis</i>
		<i>Lasiurus borealis</i>
		<i>Tadarida brasiliensis</i>
		<i>Tadarida similis</i>
		<i>Mormopterus kalinowskii</i>
		<i>Molossus molossus</i>
		<i>Eumops auripendulus?</i>
		<i>Eumops perotis</i>

for the most part, there appears to be no evidence that would argue against Chapman's conclusions.

The Peruvian and Colombian passes act as filters between the two divisions of tropical South America. Passes in both countries are associated with arid or semiarid regions, which greatly restrict the movement of rainforest-adapted animals. This habitat restriction, combined with the varied elevational tolerance of different species, doubtless has played an important role in determining bat distribution. In northern Perú, most species of bats never cross the Andes, whereas some, such as *Glossophaga soricina* and *Molossus molossus*, have crossed and formed trans-Andean subspecies, and others, already mentioned, may live in the passes or may even migrate seasonally through them.

Recent trans-Andean dispersal is particularly well illustrated by the ranges of *Platalina genovensium*, *Glossophaga soricina valens*, *Uroderma bilobatum thomasi* (see Davis, 1968), and *Amorphochilus schnablii*.

Pleistocene environmental fluctuations apparently greatly modified and possibly even reversed the influence of filtration. According to Haffer (1967a), repeated expansion and contraction of rainforest and non-rainforest vegetation have corresponded with alternating wet glacials and dry interglacials, respectively, during the Pleistocene, and alternating wet and dry periods have continued throughout post-Pleistocene times. After an extensive study of bird zoogeography and speciation in Colombia, Haffer (1968) concluded that "many if not most Colombian bird species inhabiting the uplands and lowlands today were differentiated during the Pleistocene rather than in Tertiary time." He suggested that isolation and subsequent differentiation of many bird populations was probably caused by the changing distribution of rainforest and non-rainforest vegetation. This interpretation is supported by the observations of Chapman (1926:62, 117) in Ecuador.

He found strikingly different avian faunas, with widely separated geographic origins, occurring side by side in rainforest and non-rainforest regions, and argued strongly against fortuitous dispersal. The meager information available suggests that the distribution and speciation of bats may be the result of events similar to those suggested for birds by Chapman (1926) and Haffer (1967*a,b,c*, 1968).

Along with the importance of rainforest and non-rainforest expansions and contractions during the Pleistocene, the overall cooling effects of glacial cycles must be considered. Though actual glaciation seldom extended below an elevation of approximately 12,000 feet in the Andes, lowered periglacial temperature may have had the effect of producing environments as low as 7000 feet that would occur today only at approximately 9000 feet in elevation. Such changes, correlated with rainforest and non-rainforest alternation, could exert a profound effect on trans-Andean bat movements. During an interglacial period a lowland non-rainforest species could extend its range through a pass and a subsequent glacial period could effect the complete isolation of segments east and west of the Cordillera. At the same time, it is conceivable that a species primarily associated with rainforest could have crossed from east to west at the beginning of an interglacial when the mean temperature might have risen more rapidly than the forest vegetation contracted. These rainforest-associated species would become isolated later during the interglacial, when the passes once more became dry and arid. Some species, which are able to occupy elevations of 9000 feet or higher and which are not restricted severely by rainforest or non-rainforest environments, may have been relatively unaffected by Pleistocene climatic changes. Bats such as *Anoura geoffroyi* and *Desmodus rotundus*, for example, which are known to occur at elevations of at least 9000 and 11,000 feet, respectively, and which are not noticeably restricted by "rainforest" or "non-rainforest" environments, occur commonly on both sides of the Andes without forming trans-Andean races. On the other hand, *Glossophaga soricina*, which has not been collected above 6000 feet, did form trans-Andean races. *G. s. valens*, which is arid-adapted, apparently differentiated in the west and subsequently reinvaded the east, where it is restricted to the arid environment of the Marañón Valley.

Knowledge of the 23 species of bats recorded from western Perú is extremely limited. Nevertheless, a discussion of the possible origin of this fauna is presented with the intent of stimulating further study of the significant problems involved. For purposes of discussion, the Pacific coast fauna can be divided into three general groups: (1) pre-Andean residents, (2) trans-Andean emigrants, and (3) coastal Ecuadorian emigrants.

Chapman (1926:45, 73), in his study of the arid-adapted bird fauna of Pacific Ecuador and Perú, found evidence that some formerly continuous

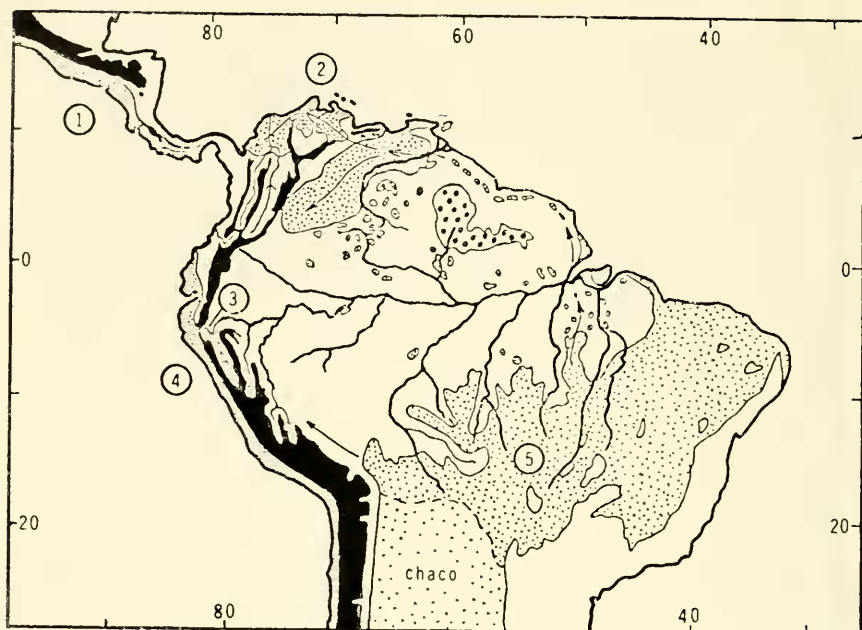


FIG. 2. Present distribution of non-forest vegetation in tropical South and Central America (modified after Haffer, 1967). Elevations higher than 1000 meters are in black. Open stipple represents the following: cerrado, campos and caatinga south of the Amazon River; chaparral and savannas of northern South and Central America with galley forests or small patches of deciduous woods, or both; semidesert and desert along the Pacific coast of South America. The savannas of the Guiana table mountains and of part of the surrounding lowlands are heavily stippled. White areas are forest. Arrows indicate advancing non-forest faunas during dry climatic periods of the Pleistocene and post-Pleistocene.

1, Central American non-forest region; 2, Colombian-Venezuelan non-forest region; 3, location of the arid Marañón Valley and north Peruvian passes; 4, arid Pacific coastal region; 5, Brazilian non-forest region. The campos just north of the lower Amazon river are more extensive than indicated on the map.

populations had been broken by the elevation of the Andes. He concluded that the most distinctive forms were pre-Andean, and "hence that prior to the elevation of the Andes this region was, in part at least, arid or semi-arid." Schmidt and Walker (1943), however, in a study of the reptiles of coastal Perú, concluded that despite a large number of endemics, the arid coast seemed clearly to be a relatively recent desert, in which there had not been time for the evolution of specifically "xerocole" types. Information presented by Ogilvie (1922:109) seems to corroborate Schmidt's interpretation.

Platalina genovensium, *Amorphochilus schnablii*, and *Tomopeas rufus* seem likely to have occupied an arid or semiarid coastal region for a considerable period of time. Chapman's (1926:51) work seems to indicate that most post-Andean evolution of birds in western Ecuador has not yet

reached the generic level. In contrast, *Tomopeus ravus*, which is arid-adapted and represents a distinctive subfamily, indicates a relatively long period of divergence. *T. ravus* may be at least distantly related to *Rhogeessa tumida* (Miller, 1900b), which inhabits both rainforest and non-rainforest environments of northern South America. The nearest living relatives of *Platalina genovensium* and *Amorphochilus schnablii* are *Lonchophylla mordax* (Thomas, 1928a) and *Furipterus horrens*, respectively. Both *L. mordax* and *F. horrens* are widely distributed from Panamá south through Brazil, and both have been reported from the Peruvian Amazonas. Neither, however, has been reported from western Ecuador. This distribution may have resulted from east-west splitting of continuous ancestral populations during uplift, or from early trans-Andean emigration. Both *P. genovensium* and *A. schnablii* have subsequently crossed the Andes from west to east to invade at least the arid Marañón Valley. Such west coast divergence and subsequent trans-Andean dispersal into the Marañón Valley also has been observed in a number of birds (Chapman, 1926:73).

Present knowledge of ecological and elevational requirements of Peruvian bats, combined with a consideration of Pleistocene environments, indicates that the trans-Andean passes of northern Perú may have played an important role in speciation. Haffer (1967a,c) made an extensive study of the probable routes of dispersal and divergence of non-rainforest birds and concluded that a number of species moved northward from southern Brazil, Bolivia, and Argentina. This northward dispersal apparently followed two main routes, both of which were at least partially dependent on interglacial expansion of non-rainforest environments. One route followed the east coast of Brazil, the Guianas, and Venezuela into northern Colombia. The other, of much greater importance to the Peruvian fauna, followed the eastern border of the Andes to the Marañón Valley, whence it crossed via the passes in northern Perú to the Pacific coast of Perú and Ecuador (see Fig. 2). According to Haffer (1967c), both routes have enhanced the fauna of Colombia north of the Andes.

The western route, which follows the eastern slopes of the Andes to northern Perú, owes its existence to a combination of large, arid, inter-Andean valleys and the probable expansion of non-rainforest environments during interglacials. Haffer (1967a) suggested that dry pockets along the eastern side of the Andes established a "discontinuous connection of the non-[rain]forest restricted Brazilian fauna with the Marañón and the arid Pacific." Several species of bats appear to corroborate such a hypothesis.

Although I have been unable to locate ecological data, perusal of distributional records seems to indicate that both *Promops nasutus* and *Promops occultus* inhabit non-rainforest areas. *P. nasutus* is known from Brazil, Paraguay, and Argentina, and *P. occultus* is known only from Paraguay.

Promops davisoni from western Perú appears to be closely allied to, and somewhat intermediate between, *P. nasutus* and *P. occultus* (Thomas, 1921). The most likely hypothesis for explaining this distribution appears to be trans-Andean dispersal in northern Perú with subsequent isolation and divergence. A similar example is that of *Eptesicus dorinus* and *Eptesicus innoxius*; the former occurs in Argentina, eastern Brazil, Paraguay, and Uruguay, and the latter occurs in western Perú and Ecuador and possibly in Argentina (Villa-R. and Villa Cornejo, 1969). If, indeed, *E. innoxius* does occur in northern Argentina, such a distribution provides additional evidence of trans-Andean dispersal in northern Perú. It is possible that *E. innoxius* underwent isolation and divergence in western Perú and Ecuador and subsequently reinvaded the east. Further collecting in the Marañón and Urubamba valleys may provide valuable evidence concerning the zoogeographic history of this bat. Further evidence for trans-Andean dispersal of bats in northern Perú is provided by the geographic distributions of *Eumops auripendulus*, *Eumops perotis*, and possibly also *Vampyrops helleri*.

Unfortunately, little is known concerning the bat fauna of Ecuador. Some species not yet known to occur in that country probably will be found to have continuous distributions between Colombia and northwestern Perú. If true, however, this still would not rule out the possible importance of the northern Peruvian passes in providing avenues of dispersal across the Andes prior to northward movement (see distribution of *Crax rubra*—Haffer, 1967c).

Actually, the contrasting rainforest and non-rainforest environments of northern and southern Ecuador, respectively, probably prevent many species of bats from occupying both of those regions. Chapman (1926:46) found that 50 species of Colombian Pacific birds reach the limit of their distributions in northwestern Ecuador. Many birds of the Colombian Pacific fauna occur no farther south than the divide between the Esmeraldas and Guayaquil drainage systems, and several species are represented north and south of the divide by different races (Chapman, 1926:55). South of this point the avian fauna shows "some obvious relations to the Brazilian non-[rain]forest fauna" and "very restricted relations to the non-[rain]forest faunas of northern South and Central America (Haffer, 1967a)." Further study of the Pacific coast bat fauna likely will reveal a similar discontinuity. The evidence now available suggests that the arid-adapted bat fauna of the Pacific coastal region of Perú and Ecuador is considerably more closely allied faunally to Brazil than to Colombia. This does not exclude the possibility that some members of the Pacific fauna are of northern origin. Several authors currently are reviewing the genus *Artibeus*, and the zoogeographic affinities of *Artibeus fraterculus* and *A. jamaicensis* will be of considerable interest. Pacific populations of these bats may have been de-

rived from either Colombia or Brazil, and quite possibly from both places.

The validity of my hypotheses may be tested through faunal analysis (1) in western Ecuador (especially north and south of the Esmeraldas and Guayaquil drainage systems), (2) in, and on both sides of, the low passes in northern Perú and eastern Colombia, (3) in the arid valleys of the Río Marañón, Río Urubamba, Río La Paz, Río Grande, Río Pilcomayo, and other river systems, and (4) in the non-rainforest areas of Argentina, southern Brazil, Bolivia, and Paraguay. Additionally, studies of the distributional restrictions imposed by elevation and by rainforest as opposed to non-rainforest environments would prove significant.

To summarize, trans-Andean passes in northern Perú are the lowest and most easily accessible to be found in the entire Andean system between southern Chile and eastern Colombia. The pass between Río Piura and Río Huancabamba (7000 feet in elevation) in northern Perú forms a complete barrier to most lowland species of bats while acting as a filter zone for some species and allowing free passage to others. The selectivity of this route of dispersal likely has been considerably altered and possibly even reversed during consecutive wet glacial and dry interglacial periods of the Pleistocene. Such a dual action of elevation and climate provides a possible mechanism whereby isolation and divergence could have occurred.

Preliminary examination of distributional records of bats and comparison with those of better known avian faunas, seems to suggest the following: (1) some Pacific coast populations are of pre-Andean origin; (2) considerable divergence at the specific and subspecific levels has resulted from Pleistocene and post-Pleistocene trans-Andean dispersal and isolation; (3) the Pacific coastal fauna is more closely allied to Brazilian faunas than to those of Colombia and northern Ecuador.

Present knowledge concerning the ecology, distribution, and systematics of South American bats is far from complete. Hence, the zoogeographic conclusions presented herein are based upon limited knowledge and should be regarded only as tentative hypotheses that provide a basis for further investigation.

SPECIES ACCOUNTS

Family EMBALLONURIDAE

Rhynchonycteris naso (Wied-Neuwied)

Distribution. Occurs along rivers throughout Amazonas: recorded from Contamana and San Jerónimo, 500 feet, Río Ucayali, Departamento de Loreto (Thomas, 1928*b*), south to Alto Río Marañón (no exact locality, AMNH 169952-53), and Marcapata, Departamento de Cuzco (Sanborn, 1951*a*).

Remarks. On the Río Azupizu these bats roosted in groups of 5-20 individuals on the shaded parts of trees or old logs that protruded over water.

Reproduction. 21-22 July: 2 pregnant females (c-r lengths 18, 23). 1 non-pregnant female, 2 males (testes 3.5 x 2, 5 x 3). 10 August: 1 non-pregnant female. 18 August: 1 male (testes 6 x 4).

Specimens collected (15). San Juan, 11 (7 USNM); San Pablo, 4.

Saccopteryx bilineata (Temminck)

Distribution. Occurs throughout Amazonas; recorded from Contamana, 500 feet, Río Ucayali, Departamento de Loreto (Thomas, 1928*b*), south to Huajyumbé, near Marcapata, Departamento de Cuzco (Sanborn, 1951*a*).

Remarks. Colonies of 5-30 individuals of this species were found in hollows formed by large vines growing against tree trunks, and in hollow logs. A hollow log in which nine individuals were captured had an inside diameter of 4½ feet, a length of 25 feet, and was open at only one end. It was lying on the ground, but the opening in the butt of the log was 6 feet above the ground. The foliage above was relatively thin, allowing light to enter. Vegetation in the surrounding area was second growth jungle; other roosts were found, however, in dense, heavily shaded areas in mature forest. In hollow trees these bats roosted within a few feet of *Carollia perspicillata*, *Micronycteris megalotis*, and *Micronycteris hirsuta*. The greater white-lined bat was one of the commonest bats at San Pablo and San Juan where it was usually among the earliest flyers after sundown and also was shot while feeding only a few minutes before sunrise.

Reproduction. 27 June: 1 pregnant female (c-r length 6.5). 21 July: 1 pregnant female (c-r length 16), 1 non-pregnant female. 26 July: 1 pregnant female (c-r length 9), 1 non-pregnant female. 5 August: 1 pregnant female (c-r length 20). 10 August: 12 pregnant females (c-r lengths 12-20, av. 15.7), 7 non-pregnant females, 7 males (testes 2 x 1 to 5 x 4, av. 3 x 1.9). 14-16 August: 3 non-pregnant females, 1 male (testes 3 x 2). 18-19 August: 12 pregnant females (c-r lengths 14-22, av. 19.1), 5 males (testes 3 x 2 to 4 x 2, av. 3.2 x 2). 25 August: 5 pregnant females (c-r lengths 14-20, av. 17.8), 4 non-pregnant females.

Specimens collected (100). San Juan, 73 (71 USNM and many others discarded); San Pablo, 26; San Ramón, 1.

Saccopteryx canescens Thomas

This bat is known in Perú from a single specimen taken at Puerto Victoria, Río Pachitea, Departamento de Huánuco (Sanborn, 1937).

Saccopteryx leptura (Schreber)

Distribution. Occurs throughout Amazonas and to elevations of at least 3000 feet in Andes (Thomas, 1893); recorded from Pebas, Río Amazonas, Departamento de Loreto (Thomas, 1928*c*), south to Bellavista [Bella Vista], Río Apurimac, Departamento de Cuzco (Sanborn, 1937). According to Sanborn's distribution map, Bellavista should be approximately on the border between the departments of Cuzco and Madre de Dios in southern Perú. There are two towns named Bella Vista near the site indicated; the most distant is about 108 kilometers east of the Peruvian border on the Río Tahuamanu, Brazil; the nearest is about 400 kilometers SSW Machu Picchu, Río Apurimac, Departamento de Cuzco, and is apparently the locality to which Sanborn referred.

Remarks. Five individuals were found near San Juan roosting together 25 feet up on the side of a tree in mature evergreen forest; the tree was 2½ feet in diameter.

Reproduction. 10-11 August: 1 non-pregnant female, 3 males (testes 4 x 3, 4 x 2, 3 x 2). 25 August: 1 male (testes 3 x 2).

Specimens collected (5). San Juan, 5.

Cormura brevirostris (Wagner)

Distribution. Known from *Puerto Indiana, near Pebas, Río Amazonas, Departamento de Loreto (Sanborn, 1937); Tingo Maria, Río Huallaga, Departamento de Huánuco (Sanborn, 1936); south to Río Inambari in southern Perú (no exact locality, departamento not specified—Thomas, 1913*a*).

Remarks. Two individuals from San Juan were collected by Campa Indians from a hollow tree in which a small colony of *Saccopteryx bilineata* also roosted.

Reproduction. 20 August: 2 males (testes 4 x 3, 3 x 2).

Specimens collected (2). San Juan, 2.

Peropteryx kappleri Peters

Distribution. Known from Marcapata, Departamento de Cuzco (Sanborn, 1951*b*), and from San Juan.

Remarks. Specimens taken at Marcapata were described as *Peropteryx kappleri intermedius* by Sanborn because they were intermediate in size between *P. k. kappleri* Peters and *P. macrotis*

(Wagner). Forearm lengths of Sanborn's four specimens were 45.4-49.5. The specimen here reported from San Juan (forearm 48.2), where *P. macrotis* also occurs, extends the known Peruvian range of this bat approximately 525 kilometers to the northwest.

My one specimen was shot from among many other similar bats that were in flight after being disturbed in a large but shallow cave in mature evergreen forest. The cave opened beneath large boulders in which many cracks and crevices were found; a stream flowed from the opening. *Phyllostomus hastatus* and *Vampyrops vittatus* were collected in the same cave.

Reproduction. 16 August: 1 non-pregnant female.

Specimen collected (1). San Juan, 1.

Peropteryx macrotis (Wagner)

Distribution. Known from *Puerto Indiana, near Pebas, Río Amazonas (Sanborn, 1937), and from Lagarto, Río Ucayali (Thomas, 1920*b*), both in Departamento de Loreto, south to Machu Picchu, Departamento de Cuzco (Thomas, *loc. cit.*; Sanborn, *loc. cit.*), and La Pamapa, Departamento de Puno (Sanborn, 1951*b*).

Remarks. Ten specimens were shot from a cluster of about 25 found roosting under a root ledge over a small stream in mature forest. Two were netted, and another was shot as it fed over a small garden at dusk. The subspecies reported from Perú is *P. m. macrotis* (Wagner).

Reproduction. 21 July: 1 male (testes 3 x 1). 11 August: 3 pregnant females (c-r lengths 6, 11, 13), 2 males (testes 2 x 1, 2 x 1).

Specimens collected (13). San Juan, 12; San Pablo, 1.

Peronymus leucopterus (Peters)

This bat is recorded from Perú only from Tushemo [Tushma], near Masisea, Río Ucayali, Departamento de Loreto (Thomas, 1924). The single specimen was described by Thomas as *P. cyclops*, which equals *P. leucopterus cyclops* (Sanborn, 1937). Cabrera (1958:52) placed *Peronymus* as a subgenus of *Peropteryx*.

Centronycteris maximiliani (Fischer)

This species was reported from the high plains of Perú by Taczanowski (Peters, 1872), but no specific locality was given.

Diclidurus albus Wied-Neuwied

A single specimen was examined from Parimari [Parinari], Río Amazonas, Departamento de Loreto (AMNH 99310).

Diclidurus scutatus Peters

A specimen in the American Museum of Natural History (AMNH 99309) is labeled as from Perú but lacks additional locality data.

Family NOCTILIONIDAE

Noctilio labialis (Kerr)

Distribution. Occurs along rivers throughout Amazonas; known from Yurimaguas, 600 feet, Río Huallaga (Osgood, 1914) and from Pucallpa, Río Ucayali (Sanborn, 1949*b*), both in Departamento de Loreto, south to *Luisiana, Río Apurímac, Departamento de Cuzco (AMNH 208055-208057).

Remarks. These bats were observed and captured especially at dusk, when groups of 8-15 individuals would fly up the Río Azupízu 2-7 feet above the water and about 25 feet from shore. The subspecies reported from Perú is *N. l. zaparo* Cabrera.

Reproduction. 21 July: 2 pregnant females (c-r lengths 14, 16), 1 non-pregnant female, 1 male (testes 7 x 4). 26 July: 1 male (testes 5 x 8).

Specimens collected (7). San Juan, 2 (AMNH); San Pablo, 5.

Noctilio leporinus (Linnaeus)

Distribution. Probably occurs along large rivers throughout Amazonas; recorded from Pebas, Río Amazonas (Thomas, 1928*c*), south to Cumeria [Cumaría] (Thomas, 1928*b*), Yarinacocha, and Pucallpa (Sanborn, 1949*b*), Río Ucayali, Departamento de Loreto.

Remarks. Some of these fish-eating bats were lured into mist nets by treating the water along the edge of the Río Azupizo with barbasco (a native fish poison). The barbasco killed many small minnows, which floated to the surface and attracted the bats. Campa Indians report that large numbers of these bats often congregate at places where fish are being poisoned at night. *N. l. leporinus* (Linnaeus) is the subspecies reported from Perú.

Reproduction. 7 July: 1 pregnant female (c-r length 38). 19 July: 1 pregnant female (young born in captivity). 21 July: 1 male (testes 8 x 5). 26 July: 1 non-pregnant female.
Specimens collected (10). San Juan, 7 (1 USNM); San Pablo, 3.

Family PHYLLOSTOMATIDAE

Pteronotus parnellii (Wagner)

Two specimens of *P. p. rubiginosus* (Wagner) collected at Tingo Maria, 2000 feet, Río Huallaga, Departamento de Huánuco (Thomas, 1927*b*), are the only Peruvian records known to me. Jones (1966) and several others before him gave reasons for use of the specific name *parnellii* rather than *rubiginosus*.

Pteronotus suapurensis (J. A. Allen)

This naked-backed bat has been reported from Yarinacocha, Río Ucayali, Departamento de Loreto by Sanborn (1949*b*). The subspecific status of this species in Perú is not clear.

Micronycteris behni (Peters)

This bat has been recorded from Perú only from the Río Cosnipata, Distrito and Departamento de Puno (Andersen, 1906).

Micronycteris hirsuta (Peters)

Distribution. Known only from San Juan.

Remarks. Specimens collected near San Juan are the first records of this bat from Perú. The nearest previous localities of record are Magdalena, Colombia (Herskovitz, 1949), and British Guiana [Guayana] (Hill, 1964).

Three big-eared bats were shot from a group of six that were roosting singly about 15 feet up inside a hollow tree. The bats may have been in a cluster before they were disturbed. There was an opening on the tree, near the ground, that was 2 feet high and 1 foot wide, and another opening about 1 foot in diameter some 25 feet up, where the hollow ended. The cavity in which the bats were shot was 3 feet in diameter at the base and narrowed to about 2 feet in diameter near the top. *Carollia perspicillata* and *Saccopteryx bilineata* were also collected in this roost.

Reproduction. 26 July: 1 pregnant female (c-r length 19), 1 non-pregnant female, 1 male (testes 4 x 2).

Specimens collected (3). San Juan, 3.

Micronycteris megalotis (Gray)

Distribution. Occurs throughout Amazonas; recorded from Yarinacocha, Río Ucayali, Departamento de Loreto (Sanborn, 1949*b*), south to Marcapata, Departamento de Cuzco (Sanborn, 1951*a*), and to an elevation of at least 3000 feet in Andes at Chinchavita, Departamento de Huánuco (Thomas, 1927*b*).

Remarks. I found bats of this species roosting under a root ledge above a stream, in fallen logs, and in hollow trees, where they formed clusters of 5-25 individuals. One roost was inside a hollow tree 4 feet in diameter and more than 100 feet tall. Bats appeared to enter through a hole (2 feet high and 6 inches wide) in the base. The tree was in a relatively open area and was surrounded by dense vines. The Peruvian subspecies is *M. m. megalotis* (Gray).

Reproduction. 28 June: 1 male (testes 2 x 1.5). 13 July: 1 male (testes 1 x 1). 10-11 August: 1 pregnant female (c-r length 25), 2 non-pregnant females, 1 male (testes 2 x 1). 12-13 August: 1 pregnant female (c-r length 20), 12 non-pregnant females, 4 males (testes 3 x 2, 2 x 1, 1.5 x 1, 1 x 0.5). 14 August: 1 male (testes 1.5 x 1). 19-21 August: 2 males (testes 2 x 1, 2 x 1). 23 August: 5 non-pregnant females, 1 male (testes 2 x 1).

Specimens collected (61). San Juan, 58 (USNM); San Pablo, 2; San Ramón, 1.

Micronycteris minuta (Gervais)

Distribution. Known only from San Pablo.

Remarks. Two *M. minuta* collected near San Pablo are the first Peruvian records. Cucuta, Colombia (Sanborn, 1949a), and Pará and Santa Catherina, Brazil (Andersen, 1906), represent the localities nearest Perú whence specimens have been reported previously. Both Peruvian specimens were netted in mature evergreen forest where Campa Indians had cleared most of the low vegetation to facilitate gathering of rubber from the larger trees.

Reproduction. 9 July: 1 non-pregnant female. 16 July: 1 non-pregnant female.

Specimens collected (2). San Pablo, 2.

Micronycteris nicefori Sanborn

Four specimens reported from *[Puerto] Indiana, Río Amazonas, Departamento de Loreto (Piriot, 1968) provide the only record of the white-lined forest bat from Perú.

Barticonycteris daviesi Hill

Distribution. Known only from San Juan.

Remarks. Until three specimens were collected near San Juan, *B. daviesi* was known only by the holotype, captured on 3 December 1963, at a place 24 miles from Bartica, British Guiana [Guayana] (Hill, 1964). Peruvian specimens (USNM 364256-364257) extend the known range of this bat approximately 2650 kilometers to the southwest.

Specimens from Perú correspond closely with Hill's description of the holotype from Guayana. Two of the *B. daviesi* had entirely pigmented wings, but one male had an unpigmented stripe about half an inch wide on each wing along the body. The same individual also had unpigmented wing tips. External measurements of a female and two males are, respectively: total length, 90, 82, 91; length of tail, 7, 5, 7; length of hind foot, 20, 19, 19; length of ear, 31, 28, 29; length of forearm (dry), 53.8, 58.1, about 58 (wings spread); weight, 34 (pregnant), 24, 27. Unfortunately, all three skulls were damaged by shotgun pellets.

According to our reliable Campa Indian collector, Carlos Perez, the three *B. daviesi* were shot while roosting together in a hollow tree in mature forest.

Reproduction. 14 August: 1 pregnant female (c-r length 33), 2 males (testes 5 x 4, 4 x 3).

Specimens collected (3). San Juan, 3 (USNM).

Lonchorhina aurita Tomes

Distribution. This species has been taken only at San Juan.

Remarks. Five specimens from San Juan are the first to be recorded from Perú. The nearest localities of record previously reported were the Canal Zone, Panamá (Handley, 1966b), San Estaban, Venezuela (Anthony, 1923), Pará, Brazil (Vieira, 1942:305-306), and San Matais, Bolivia (Sanborn, 1932a).

All specimens were netted over trails in mature evergreen forest near the Río Azupizu. They differ from *L. occidentalis* (Anthony, 1923), described from Guayas, Ecuador, in having longer ears and forearms and in lacking blotches of ivory-yellow on the posterior margins of the wings. The following measurements were recorded from three Peruvian specimens (a male and two females, respectively); forearm 53.4, 53.7, 56.0; ear from notch 31, 32, 32. Measurements of the holotype of *L. occidentalis* (as given by Anthony) are, respectively, 48.7 and 25.5.

Unfortunately, *L. occidentalis* (Anthony) was omitted by Cabrera (1958) from his check list; however, recent authors (Goodwin and Greenhall, 1961:233; Hall and Kelson, 1959:104; Handley, 1966b; Jones, 1966) have followed Sanborn (1932a) in referring to *L. occidentalis* as a subspecies of *L. aurita*. Lacking adequate comparative material, specimens from Perú are tentatively classified as *L. a. aurita*, despite the fact that the forearms are longer than the longest thus far recorded for the species from other parts of its range.

Reproduction. 23 July: 1 lactating female. 25 July: 1 male (testes 4 x 2). 11 August: 1 non-pregnant female.

Specimens collected (5). San Juan, 5 (2 USNM).

Macrophyllum macrophyllum (Schinz)

Distribution. Recorded from mouth of Río Cenipa, Departamento de Amazonas (AMNH 98761), from San Jeronimo (Thomas, 1928b) and Yarinacocha (Sanborn, 1949b), Río Ucayali, Departamento de Loreto, and herein from San Juan.

Remarks. One long-legged bat was netted over a small stream in mature forest.

Specimen collected (1). San Juan, 1 (USNM).

Tonatia bidens (Spix)

The only specimen thus far recorded from Perú was obtained at Lagarto, Alto Ucayali, Departamento de Loreto (Goodwin, 1942).

Tonatia silvicola (D'Orbigny)

Distribution. Known throughout Amazonas; recorded from Pebas, Río Amazonas, Departamento de Loreto (Thomas, 1928c), south to Marcapata, Departamento de Cuzco (Sanborn, 1951a), and to an elevation of 3000 feet in Andes at Chinchavita, Departamento de Huánuco (Thomas, 1927b).

Remarks. Four colonies of this species, consisting of 6-10 individuals each, were found roosting in hollow termite nests in mature evergreen forest. A Campa Indian collected 18, which he said came from a hollow tree. For further information see remarks in account of *Phyllostomus hastatus*. The subspecies reported from Perú is *T. s. silvicola* (D'Orbigny).

Reproduction. 8 July: 1 pregnant female (c-r length 21), 1 male (testes 5 x 3). 12 July: 1 pregnant female (c-r length 16), 1 male (testes 7 x 4). 23 August: 2 pregnant females (c-r length both 30), 21 males (testes 10 x 7 to 6 x 4, av. 8 x 5.9).

Specimens collected (34). Nevati, 2; San Juan, 28 (USNM); San Pablo, 4.

Mimon crenulatum (É. Geoffroy St.-Hilaire)

Distribution. Known from Pebas, Río Amazonas (Thomas, 1928c) to Yarinacocha, Río Ucayali (FMNH 62119-62120), both in Departamento de Loreto, and from San Juan.

Remarks. All but one of our specimens were netted in mature evergreen forest where Campa Indians had cleared away most of the low vegetation to facilitate the gathering of rubber from the larger trees. Four of the six specimens collected among the rubber trees were attracted when the first individual captured was induced to squeal. This method of attracting bats to the nets was successful for other species as well. The Peruvian subspecies is *M. c. longifolium* Wagner, of which *M. peruanum* Thomas is a synonym (see Handley, 1960).

Reproduction. 15-16 July: 1 pregnant female (c-r length 17), 3 males (testes 5 x 4, 5 x 3, 4 x 2). 25 July: 1 pregnant female (c-r length 13). 25 August: 1 male (testes 6 x 5).

Specimens collected (9). San Juan, 2 (1 USNM); San Pablo, 7.

Phyllostomus elongatus É. Geoffroy St.-Hilaire

Distribution. Occurs throughout Amazonas; first vaguely reported as occurring north of 10° latitude (Tschudi, 1844:68) and later recorded from Marcapata, Departamento de Cuzco (Sanborn, 1951a).

Remarks. Colonies of from 7-15 individuals were encountered in large hollow trees in dense mature forest. One roost was found in a hollow tree with a base diameter of about 20 feet and a height of more than 100 feet. The tree was on the top of a hill in mature evergreen forest. Its base had two openings both about 2 feet wide and 4 feet high leading into a cavity; the inside diameter was 5 feet at the base but narrowed (60 feet up the tree) to about 3 feet. About 2 feet below the top of the main cavity there was another opening to the outside, allowing light to enter. Slightly above that opening was a hollow limb about 2 feet in diameter and 20 feet long with another opening at its far end. *P. elongatus* roosted at the top of the main cavity. More than 50 *Carollia perspicillata* roosted in cracks in the decaying sides from 5 feet above the ground level to within approximately 10 feet of the *P. elongatus*, and about 20 *Saccopteryx bilineata* were roosting in the hollow from just inside the lower entrances to about 30 feet high. Two shots fired up inside the hollow from my 12-gauge shotgun (dust shot), brought down seven *P. elongatus* along with *Carollia* and *Saccopteryx*. Additional *P. elongatus* were probably present, but some bats evidently escaped into the hollow limb. Two more shots brought down only *Carollia* and *Saccopteryx*.

P. elongatus were most often netted in or near garden plots where bananas were grown; the heads of netted individuals frequently were covered with yellow pollen. Captives, induced to squeal, quickly attracted additional individuals of both *P. elongatus* and *P. hastatus*.

Reproduction. 6-7 July: 1 pregnant female (c-r length 10), 2 non-pregnant females, 1 male (testes 6 x 3). 9 July: 1 male (testes 6 x 4). 11 July: 1 male (testes 4 x 5). 16 July (specimens from described roost): 2 pregnant females (c-r length 16 and 22), 2 non-pregnant females, 3 males (testes 6 x 3, 6 x 3, 4 x 3). 20 July: 2 males (testes 5 x 3, 3 x 2). 23 July: 1 pregnant female (c-r length 21), 1 male (testes 6 x 3). 25 July: 2 pregnant females (c-r length 20). 13 August: 1 male (testes 8 x 6). 27 August: 1 pregnant female (c-r length 33).

Specimens collected (31). San Juan, 15 (9 USNM); San Pablo, 16.

Phyllostomus hastatus (Pallas)

Distribution. Common throughout Amazonas; recorded from Shapaja, Juan Guerra, Tarapato, *Rumisapa and the Río Ponasá, all in the Departamento de San Martín (Jamet and Vasquez, 1957), south to Marcapata, Departamento de Cuzco (Sanborn, 1951a).

Remarks. These bats were found in colonies of 10 to 100 or more individuals, depending on the size of the roosting place. They were collected from hollow trees and termite nests, caves, and palm-thatched roofs. On the ceilings of caves this bat usually was found in clusters of 10-30 individuals. No roosts of *Tonatia sylvicola* were found that did not contain one or two *P. hastatus*; both sexes were encountered in *Tonatia* roosts. *P. hastatus* was most often netted around the edges of villages, especially near gardens where bananas were grown. Netted specimens were frequently at least partially covered with pollen. The subspecies reported from Perú is *P. h. curaca* Cabrera.

Reproduction. 15-17 June: 1 non-pregnant female, 7 males (testes 4 x 2 to 8 x 5, av. 6 x 4). 1-6 July: 19 males (testes 4 x 3 to 9 x 5, av. 6.5 x 4). 19 July: 1 male (testes 9 x 5). 16 August: 12 pregnant females (c-r length 22-30, av. 27.4), 8 non-pregnant females, 4 males (testes 8 x 5, 8 x 4, 7 x 5, 5 x 3).

Specimens collected (119). Nevati, 29; San Juan, 86 (82 USNM); San Pablo, 4.

Trachops cirrhosus (Spix)

Distribution. Known in Perú from Tushemo [Tushma], near Masisea, Río Ucayali, Departamento de Loreto (Thomas, 1928b), and from San Juan. There is also a specimen labeled "Río Maranon, Pebas" (FMNH 29450). This individual probably was collected at Pebas, Río Amazonas, Departamento de Loreto.

Remarks. One of the two specimens collected was netted over a trail where many vines grew in mature forest by a stream. The other was netted at the edge of a large clearing, which had been virgin forest until the day before when it was cleared to lengthen an airstrip. The Peruvian subspecies is probably *T. c. cirrhosus* (Spix), which has been reported from northern Brazil, Colombia, the Guianas, Venezuela, and Panamá.

Reproduction. 25 July: 1 pregnant female (c-r length 17).

Specimens collected (2). San Juan, 2 (1 USNM).

Vampyrum spectrum (Linnaeus)

Linnaeus' false vampire bat is probably widely distributed in Amazonas and along the eastern slopes of the Andes, but it has been recorded from Perú only twice. The records are from Yarinacocha, Río Ucayali, Departamento de Loreto, and from Cosñipata, Paucartambo region, Departamento de Cuzco (Sanborn, 1949b). *V. s. spectrum* is the subspecies reported from Perú.

Glossophaga soricina (Pallas)

Distribution. Occurs throughout the lowlands of Perú on both sides of Andes; recorded east of Andes from Pebas, 330 feet, Departamento de Loreto (Thomas, 1928c), south to Idma, 6000 feet, Departamento de Cuzco (Thomas, 1920b), and west of Andes from Zorritos, Departamento de Tumbes (G. M. Allen, 1908), south to Valle del Tambo, Departamento de Arequipa (de la Puente, 1951:8-9).

Remarks. Near San Ramón these bats were found roosting in clusters of four to eight individuals in a cement drain beneath a sawmill. They roosted near similar clusters of *Carollia perspicillata*. *G. soricina* was taken at Nevati in nets set among blooming cashew trees. Two subspecies are recorded from Perú, *G. s. soricina* (Pallas) to the east of the Andes in Amazonas and *G. s. valens* (Miller) to the west of the Andes and also in the arid Marañón Valley.

Reproduction. 27 June: 2 non-pregnant females, 1 male (testes 5 x 3). 5-7 July: 1 non-pregnant female, 2 males (testes 7 x 5, 6 x 4). 16 July: 1 pregnant female (c-r length 10), 1 male (testes 6 x 5). 26 July: 1 male (testes 4 x 2.5). 10-19 August: 1 non-pregnant female, 5 males (testes 5 x 4, 5 x 4, 5 x 4, 4 x 3, 4 x 3).

Specimens collected (25). Nevati, 7; San Juan, 8 (7 USNM); San Pablo, 3; San Ramón, 7.

Lonchophylla hesperia G. M. Allen

The only Peruvian records are west of the Andes from Zorritos, Departamento de Tumbes (G. M. Allen, 1908), and from an unspecified locality in the Departamento de La Libertad (USNM 283177).

Lonchophylla mordax Thomas

An individual obtained at *[Puerto] Indiana, Río Amazonas, Departamento de Loreto (Pirlot, 1968), is the only record known from Perú. Pirlot used the specific name *concava* for this species, which is a synonym of *mordax* (see Handley, 1966b).

Lonchophylla robusta Miller

Distribution. Known only from San Juan and San Ramón.

Remarks. A specimen from San Ramón and another from San Juan are the first to be recorded south of San Gil and Sasaima, Colombia (Sanborn, 1941). The two Peruvian specimens differ from typical *robusta* in being larger, having a narrow interfemoral membrane, and possessing a short, sparse (but distinct) fringe of hairs along the posterior edge of the interfemoral membranes, and are only tentatively referred to that species. External measurements of a male and female are, respectively: total length, 80, 84; length of tail, 5, 6; length of hind foot, 14, 14; length of ear, 17, 17; length of forearm, 45.9, 45.4; weight, —, 16. Cranial measurements of the female are as follows: greatest length 27.0; depth of braincase 8.0; zygomatic breadth 11.3; breadth of braincase 10.4; interorbital breadth 5.3; length of maxillary toothrow 10.0; palatal breadth 6.6; palatal length 7.8.

A male was netted beneath a small clump of banana trees in an area of secondary growth near steeply rising hillsides and virgin evergreen forest. One female was taken at the edge of mature evergreen forest where many large trees had been cut the previous day to enlarge an airstrip.

Reproduction. 28 June: 1 male (testes 3 x 2). 5 August: 1 non-pregnant female.

Specimens collected (2). San Juan, 1 (USNM); San Ramón, 1.

Platalina genovensium Thomas

This rare bat has been recorded west of the Andes from Sullana, Departamento de Piura (Aellen, 1965), vicinity of Lima, Departamento de Lima (de la Puente, 1951:13), and Caraveli [Caraveli], Departamento de Arequipa (USNM 268765 and de la Puente, 1951:13), and east of the Andes from Huanaco [Huánuco], Departamento de Huánuco (Sanborn, 1936 and de la Puente, 1951:13-14).

Lionycteris spurrelli Thomas

Distribution. Known from Nevati, San Juan, and San Pablo. Additionally, a specimen in the American Museum of Natural History (AMNH 145504) is labeled **"Peru: Quincemil, 2000 ft."

Remarks. Specimens here reported are the first to be recorded from Perú. The nearest previous localities of record are Condota, Chocó, Colombia (Thomas, 1913b), and Itabu Creek Head, Corentyne River, Boundary Camp, Guayana (Sanborn, 1941). Two of these bats were netted around the edges of native villages, and one was caught in a net set among blooming cashew trees.

Reproduction. 15 June: 1 male (testes 3 x 2). 5 August: 1 pregnant female (c-r length 14).

Specimens collected (3). Nevati, 1; San Juan, 1 (USNM); San Pablo, 1.

Anoura brevirostrum Carter

This recently described species has been recorded from the type locality (31 km. S Tingo María, 850 meters), from 19 km. S Tingo María, and from Divisoria en Cordillera Azul, about 600 meters, all in the Departamento de Huánuco (Carter, 1968).

Anoura caudifera (É. Geoffroy St.-Hilaire)

Specimens have been recorded from the *Victor Valley, near Tarma, Departamento de Junín (Sanborn, 1941), three localities in the Departamento de Cuzco, and from Segrario [Sagraria], Departamento de Puno (Sanborn, 1951a). All of these localities are on the eastern slopes of the Andes at elevations of 2000-9000 feet. *A. c. aequatoris* (Lönningberg) is the subspecies reported from Perú.

Anoura geoffroyi Gray

Distribution. Occurs along both sides of Andes where it has been collected at elevations of 1000-9000 feet. Known west of Andes from Huancabamba, Departamento de Piura (San-

born, 1933), south to Provincia de Lima, Departamento de Lima (de la Puente, 1951:11), and east of Andes from Shapaja, Juan Guerra, and Lomas, Departamento de San Martín (Jamet and Vasquez, 1957), south to Ollantaytambo [Ollantaitambo], Departamento de Cuzco (Thomas, 1920b).

Remarks. A colony of about 75 of these bats was encountered in a long tunnel at a power plant located 32 km. NE Tarma. Several small clusters were roosting in depressions on the rough earthen and rock ceiling of a room about 30 feet high and 25 feet wide. The room was about 200 feet from the entrance of the tunnel and was completely dark. Of the 51 specimens captured, 17 were females and 34 were males. The area surrounding the tunnel was dry and rocky with no trees nearer than 750 meters where several small varieties grew along the Río Palca. There were, however, many low flowering shrubs on the nearby slopes.

Two *A. geoffroyi* were netted in front of a 12-foot bush covered with yellow flowers, three-fourths of an inch wide, that tapered to narrow bases that were one and three-fourths inches long. The same tree was exceptionally attractive to hummingbirds during the day.

The subspecies recorded from Perú is *A. g. peruana* Tschudi.

Reproduction. 19 June: 1 non-pregnant female. 24 June: 2 pregnant females (c-r length 19, 42), 15 non-pregnant females, 34 males (testes 2 x 1 to 6 x 4, av. 3.3 x 2.1).

Specimens collected (56). San Ramón, 3; Tarma, 53.

Choronomiscus inca (Thomas)

The holotype was collected near the [Río] Yahuar mayo [Yaharamayo], 1200 feet, Departamento de Puno (Thomas, 1912). Two specimens recorded from Los Pozos, Ecuador, two from Kamakuso and Kartabo, British Guiana [Guayana], and nine from Chimanta-tepui, Venezuela (Handley, 1966a), indicate a wide distribution for this bat.

Choronomiscus intermedius (J. A. Allen and Chapman)

Distribution. Known only from San Pablo.

Remarks. Two specimens collected at San Pablo evidently are the first to be recorded from other than Trinidad (Goodwin and Greenhall, 1961:248) and extend the known range of this bat approximately 2800 kilometers to the southwest. They were netted in secondary growth around gardens at the edge of virgin evergreen forest.

Reproduction. 12-14 July: 2 non-pregnant females.

Specimens collected (2). San Pablo, 2.

Choronomiscus minor (Peters)

Distribution. Known from Pto. Melendez [Melendez], above Marañón, Departamento de Huánuco, and from San Juan (Handley, 1966a).

Remarks. One specimen was netted over a trail in mature evergreen forest.

Reproduction. 26 August: 1 male (juvenile, testes 1.5 x 1).

Specimen collected (1). San Juan, 1 (USNM).

Lichonycteris obscura Thomas

Distribution. Known only from San Juan.

Remarks. A single specimen collected at San Juan is the first Peruvian record for this species. Apparently, the nearest previous records were from the provinces of Darién, San Blas and Bocas del Toro, Panamá (Handley, 1966b), and from Surinam (Miller, 1900a).

One was netted over a trail in mature evergreen forest near the edge of the village clearing.

Specimen collected (1). San Juan, 1 (USNM).

Carollia castanea H. Allen

Distribution. Known from San Juan, San Pablo, and San Ramón.

Remarks. Seven specimens from Idma, Departamento de Cuzco, recorded as *Hemiderma castaneum* (Thomas, 1920b), have been identified by Dr. Charles O. Handley, Jr., as *Carollia subrufa* (see below). Specimens of *C. castanea*, that I collected near San Ramón and at San Juan and San Pablo, and a series reported from *[Puerto] Indiana, Río Amazonas, Departamento de Loreto by Pirlot (1968), are the first authentic records for Perú. According to Thomas, specimens obtained from Ecuador were similar to those from Idma, Perú. There is, therefore, considerable probability that the Ecuadorian specimens mentioned by him also are *Carollia subrufa*. The nearest definite records to Perú of *castanea* that I have been able to locate are from Río Tarra, upper Río Catatumbo, Colombia (Hershkovitz, 1949).

Specimens were netted in a plantation near San Ramón where many bananas and papayas grew, and in Campa Indian gardens and villages where the same and other fruits were present.

Reproduction. 28 June: 2 males (testes 5 x 3, 4 x 2). 19 July: 1 non-pregnant female. 23-24 July: 1 non-pregnant female, 2 males (testes 5 x 3, 5 x 3). 5 August: 1 non-pregnant female. 26 August: 1 male (testes 6 x 4).

Specimens collected (24). San Juan, 19 (9 USNM); San Pablo, 3; San Ramón, 2.

Carollia perspicillata (Linnaeus)

Distribution. Common throughout Amazonas; known from junction of Ríos Amazonas and Nany [Nanay], 16 km. below Iquitos, Departamento de Loreto (AMNH 130178-130185), south to *San Juan, Provincia de Sandia, Departamento de Puno (Sanborn, 1953).

Remarks. Colonies of 10-25 individuals were encountered, either in compact clusters or loosely associated in hollow trees and logs, buildings, and cement drains. These bats frequently occupied roosts with *Glossophaga soricina*, *Phyllostomus elongatus*, or *Saccopteryx bilineata*, and once were found roosting with *Micronycteris hirsuta*. At San Pablo, individuals entered our thatched Campa Indian hut each night to eat bananas. Before we began covering bananas, we lost up to two pounds per night. At Nevati, I caught several in rat traps, baited with banana, that were set on the ground around the periphery of the village. *C. p. perspicillata* (Linnaeus) is the subspecies reported from Perú.

Reproduction. 15-17 June: 10 non-pregnant females, 10 males (testes 3 x 2 to 7 x 5, av. 5.3 x 3.5). 26-28 June: 2 non-pregnant females. 3-7 July: 6 non-pregnant females, 5 males (testes 7 x 4, 6 x 4, 5 x 4, 3 x 2, 3 x 2). 22-26 July: 1 non-pregnant female, 2 males (testes 9 x 7, 6 x 4). 10 August: 7 non-pregnant females, 6 males (testes 8 x 6, 7 x 5, 6 x 4, 6 x 4, 6 x 4, 3 x 1). 12-13 August: 2 non-pregnant females, 2 males (testes 8 x 6, 7 x 5). 18 August: 2 non-pregnant females, 6 males (testes 9 x 5, 8 x 4, 6 x 5, 6 x 4, 3 x 2, 2.5 x 1). 26 August: 2 pregnant females (c-r length 24, 23). 27 August: 1 pregnant female (c-r length 5); 1 non-pregnant female.

Specimens collected (319). Nevati, 62; San Juan, 185; San Pablo, 60; San Ramón, 12.

Carollia subrufa (Hahn)

Seven specimens that were erroneously reported as *Hemiderma castaneum* from Idma, 6000 feet, Departamento de Cuzco (Thomas, 1920b), provide the only record from Perú, but collections probably contain other specimens that are misidentified as *C. perspicillata*. I am indebted to C. O. Handley, Jr., for the correct identification of the specimens from Idma.

Rhinophylla pumilio Peters

Distribution. Known from the following localities: Yurac Yacu, about 2500 feet, a little more than 32 km. WNW Mayobamba, Departamento de San Martín (Thomas, 1927a); *Puerto Indiano [Indiana], Río Amazonas, and 33 mi. SE Pucallpa, and Loreto, all three in Departamento de Loreto (Carter, 1966); San Juan; San Pablo.

Remarks. This bat was netted especially in Indian gardens where bananas and papayas were grown and over trails deep within mature evergreen forest. A male was captured in a banana-baited rat trap set on the ground beneath ferns in dense mature forest about a kilometer from San Pablo.

Reproduction. 16 June: 4 non-pregnant females, 1 male (testes 4 x 3). 3 July: 1 male (testes 6 x 4). 6-8 July: 2 non-pregnant females, 1 male (testes 5 x 4). 11-14 July: 2 non-pregnant females, 3 males (testes 4 x 3, 2 x 2, 2 x 1.5). 16 July: 1 non-pregnant female, 1 male (testes 5 x 3). 5 August: 1 non-pregnant female, 1 male (testes 5 x 3.5).

Specimens collected (25). Nevati, 5; San Juan, 6 (4 USNM); San Pablo, 14.

Rhinophylla fischeræ Carter

Distribution. Known from Pucallpa and from 98 km. SE Pucallpa, about 585 feet, Departamento de Loreto (Carter, 1966), and from San Juan and San Pablo.

Remarks. This bat is easily distinguished in the field from *R. pumilio* by the long fur, which covers and overlaps its interfemoral membrane along the rump. In *R. pumilio*, the entire membrane is bare and never overlapped by long fur. *R. fischeræ* was caught in the same nets with *R. pumilio*. The two were most often taken in or near gardens where bananas and papayas were grown.

Reproduction. 2 July: 1 male (testes 5 x 4). 7-8 July: 6 non-pregnant females, 3 males (testes 5 x 4, 5 x 4, 2 x 1). 13 July: 1 non-pregnant female. 22 July: 1 non-pregnant female. 25 July: 1 male (testes 6 x 5). 5 August: 1 non-pregnant female.

Specimens collected (26). San Juan, 14 (7 USNM); San Pablo, 12.

Sturnira bidens (Thomas)

This bat has been reported only from the type locality in Ecuador (Thomas, 1915) and from humid montane forest on the eastern slope of the Cordillera Carpish along the Carretera Central, between Huánuco and Tingo María, Departamento de Huánuco (Gardner and O'Neill, 1969).

Sturnira erythromos (Tschudi)

Distribution. Known from east slope of Cordillera Carpish along Carretera Central, between Huánuco and Tingo María, Departamento de Huánuco (Gardner and O'Neill, 1969), and from near Tarma, south to *Limacpuncu, near Marcapata (FMNH 75182-75185), and Machu Picchu (Gardner and O'Neill, 1969), both in Departamento de Cuzco.

Remarks. Our specimens from near Tarma appear to represent the same species that was described by Tschudi (1844:64). He recorded it as occurring between latitudes 12 and 14° S.

In the field this bat is distinguishable from *S. ludovici* (forearm 42.6-48.0) and *S. tildae* (forearm 45.0-48.0) by its smaller size (forearm 38.0-41.3), and from *S. lilium* in that the lingual sides of the lower molars are without prominent cusps, leaving a nearly continuous edge (*lilium* has prominent cusps along the inner margin of the lower molars). For comparisons of *S. bidens* and *S. erythromos*, see Gardner and O'Neill (1969).

These small bats were netted in a deep, narrow valley along a stream in a brushy forest (10-35 feet tall).

Reproduction. 19 June: 2 non-pregnant females (juveniles), 1 male (testes 5 x 3). 24 June: 1 male (testes 7 x 4).

Specimens collected (7). Tarma, 7.

Sturnira lilium (É. Geoffroy St.-Hilaire)

Distribution. Probably common throughout Amazonas; known from [Río] Huallaga (no exact locality, departamento not specified—Dobson, 1878:538-540), south to [Puerto] Maldonado, Río Madre de Dios, Departamento de Madre de Dios (FMNH 84397-84399), and Ocabamba (Thomas, 1920b), and *Quincemil, Huajyumbé [Río Huajllumbé], Provincia de Quispicanchi (FMNH 84400-84401), both in Departamento de Cuzco.

Remarks. The scarcity of records for this bat in Perú is probably due to the fact that most earlier collectors did not have mist nets and were forced to rely on finding roosts. All specimens that we collected were netted near wild fig, banana, papaya, and other fruit trees. The subspecies reported from Perú is *S. l. lilium* (Geoffroy).

Reproduction. 28-29 June: 8 non-pregnant females, 10 males (testes 2 x 1 to 7 x 6, av. 4.3 x 3.1). 4-6 July: 4 males (testes 6 x 4, 6 x 4, 5 x 4, 4 x 3). 8-9 July: 1 non-pregnant female, 1 male (testes 5 x 4). 11-13 July: 1 non-pregnant female, 6 males (testes 6 x 4, 6 x 3, 5 x 4, 3 x 3, 3 x 2, 3 x 2). 24-26 July: 1 pregnant female (c-r length 13), 4 non-pregnant females. 30 July: 2 non-pregnant females, 2 males (testes 6 x 5, 5 x 4). 4 August: 1 male (testes 5 x 3). 24 August: 1 pregnant female (c-r length 12).

Specimens collected (81). Nevati, 10; San Juan, 22 (7 USNM); San Pablo, 21; San Ramón, 28.

Sturnira ludovici Anthony

Distribution. Known from Amacho, near Marcapata, Departamento de Cuzco (FMNH 75186-75189), and from near Tarma, San Ramón, and Nevati.

Remarks. Specimens were netted at elevations of 900-7300 feet, especially near fruit trees. The subspecies reported from Perú is *S. l. ludovici* Anthony.

Reproduction. 19 June: 1 male (testes 5 x 3). 28-29 June: 1 non-pregnant female, 1 male (testes 3 x 1). 12 July: 1 male (testes 3 x 2).

Specimens collected (9). Nevati, 1; San Ramón, 7; Tarma, 1.

Sturnira magna de la Torre

Distribution. Known from the type locality at Santa Cecilia, about 350 feet, Río Maniti, near Iquitos, Departamento de Loreto (de la Torre, 1966), and from San Juan and San Pablo.

Remarks. This bat is easily distinguished from all other members of the genus, known to occur east of the Andes, by its large size (forearm 56.4-59.3). Forearms of the other Amazonian species of *Sturnira* measure less than 49 (usually not more than 47).

One specimen was taken in a net set across a narrow trail leading from San Pablo to a garden where bananas and papayas were grown. The trail was completely enclosed by dense

vines and was 6 feet wide and 7-10 feet high. Another was taken in a similar garden, and a third was netted at the edge of a large area of newly cut trees surrounded by mature forest.

Reproduction. 7 July: 1 male (testes 6 x 4). 12 July: 1 male (testes 7 x 5). 25 July: 1 male (testes 6 x 4).

Specimens collected (3). San Juan, 1; San Pablo, 2.

Sturnira tildae de la Torre

Distribution. Known from *Shahuayo, Provincia de Coronel Portillo, Departamento de Loreto, and from Nevati, San Juan, and San Pablo.

Remarks. This bat was described from Trinidad and recently recorded for the first time on the mainland of South America from Guayana (Hill, 1964). The known range of this bat is now extended across the continent to Perú.

Individuals were netted in gardens where bananas and papayas were grown and at the edge of a freshly cut area in mature evergreen forest.

Reproduction. 7-12 July: 2 non-pregnant females, 1 male (testes 7 x 5).

Specimens collected (6). Nevati, 2; San Juan, 2 (USNM); Shahuayo, 1.

Uroderma bilobatum Peters

Distribution. Recorded west of Andes from *Matapalo, Departamento de Tumbes (FMNH 81069-81078) and east of Andes from *Puerto Indiana, Río Amazonas, Departamento de Loreto (Davis, 1968), south to Marcapata, Departamento de Cuzco (Sanborn, 1951a). Ranges from lowland Amazonas to at least 6000 feet in Andes.

Remarks. Tent-making bats were netted in secondary growth around the periphery of villages and at the edge of a freshly cleared area in mature forest. *U. b. thomasi* Andersen is the subspecies reported from Perú.

Reproduction. 7 July: 1 male (testes 5 x 3). 14 July: 1 male (testes 7 x 5). 5 August: 1 pregnant female (c-r length 7). 1 male (testes 5 x 4). 12-13 August: 2 non-pregnant females.

Specimens collected (8). Nevati, 1; San Juan, 5 (4 USNM); San Pablo, 2.

Uroderma magnirostrum Davis

This species probably occurs throughout the Peruvian Amazonas. It has been reported from the mouth of the Río Mazán, from Sarayacu, Río Ucayali, and from Balta, Río Curanja, all in Departamento de Loreto (Davis, 1968).

Vampyrops dorsalis Thomas

Thomas' broad-nosed bat has been recorded from *Comante, 6500 feet (Sanborn, 1955), and from Marcapata (Sanborn, 1951a), both in the Departamento de Cuzco.

Vampyrops lineatus (É. Geoffroy St.-Hilaire)

Apparently, this bat was erroneously recorded from west of the Andes at Guayabamba, 6000 feet, Departamento de La Libertad, by J. A. Allen (1897). According to Goodwin (1953:259), the specimens in question actually originated at *Santa Rosa de Huayabamba, 6000 feet, Departamento de San Martín, on the eastern slope of the Andes. *V. lineatus* has not been reported from elsewhere in Perú.

Vampyrops vittatus (Peters)

Distribution. Recorded west of Andes from *Gruta de Niñabamba, *Hacienda Niñabamba, Provincia Hualgayoc, Departamento de Cajamarca (Peters, 1880 and Sanborn, 1955), and east of Andes from *Victoc Valley, near Tarma, Departamento de Junín, south to region near Marcapata, Departamento de Cuzco (Sanborn, 1955). For the use of *V. vittatus* in place of *V. fumosus* and *V. injuscus* see Sanborn (1955).

Remarks. Near San Ramón *V. vittatus* was netted beneath fruiting wild fig trees that were as much as 100 feet tall. Many large bats were observed near these trees; several *vittatus* were netted 600 feet from the nearest visible fig tree, while carrying partly eaten figs 30 mm in diameter. Near San Juan a compact cluster of about 20 individuals was found on the ceiling of a large but shallow cave in mature forest. The cave was wet inside and a stream flowed from its entrance. A single pistol shot of .22 dust killed nine females. Other bats shot in the same cave were *Phyllostomus hastatus* and *Peropteryx kappleri*.

Reproduction. 27-28 June: 4 non-pregnant females, 3 males (testes 6 x 4, 6 x 4, 4 x 3). 16 August: 9 non-pregnant females.

Specimens collected (17). San Juan, 9 (USNM); San Ramón, 8.

Vampyrops helleri Peters

Distribution. Recorded west of Andes from *Matapalo, Departamento de Tumbes (Sanborn, 1955), and east of Andes from Pebas, Río Amazonas (Thomas, 1928c), and from Pucallpa, Río Ucayali, both in Departamento de Loreto (Sanborn, 1949b).

Remarks. Specimens collected in 1964 extend the known range to San Juan, and to Río Seco, 2400 feet, near San Ramón, Departamento de Junín. They were netted at the edge of a newly cut area in mature forest and in secondary growth consisting of dense, low brush and vines. For use of *V. helleri* in place of *V. zarhinus* see Sanborn (1955).

Reproduction. 25 June: 1 male (testes 2 x 1). 29 July: 1 pregnant female (c-r length 22). 5 August: 2 pregnant females (c-r lengths 8, 27), 2 non-pregnant females, 1 male (testes 7 x 5). 12-13 August: 2 males (testes 4 x 3, 3 x 2).

Specimens collected (14). San Juan, 13 (10 USNM); San Ramón (Río Seco), 1.

Vampyrodes caraccioloii Thomas

Distribution. Known in Amazonas from San Lorenzo, 500 feet, Río Marañón, about opposite mouth of Río Huallaga, and from Masisea, 1000 feet, Río Ucayali, both in Departamento de Loreto (Thomas, 1924), south to San Juan and San Ramón.

Remarks. Great striped-faced bats were netted over a narrow roadway among banana plants about 100 feet from several large wild fig trees laden with ripe fruit, and over a tractor trail near a large field of ripening papayas. None of these bats was netted in the San Ramón area except near these food sources. At San Pablo one was netted over a trail leading to a garden where there were many ripe papayas. *V. c. ornatus* Thomas (type locality, San Lorenzo) is the subspecies reported from Perú.

Reproduction. 27-29 June: 2 non-pregnant females, 4 males (testes 6 x 5, 6 x 4.5, 5 x 4, 4 x 3). 7 July: 1 pregnant female (c-r length 17).

Specimens collected (7). San Pablo, 1; San Ramón, 6.

Vampyressa bidens (Dobson)

This bat is known from the Río Mazan, N of Iquitos (AMNH 98780); San Lorenzo, 500 feet, Río Marañón; and from Tushemo [Tushma], 5 km. SW of Masisea, Río Ucayali, all in Departamento de Loreto (Sanborn, 1936). It has been reported also from the [Río] Huallaga (no exact locality, departamento not specified—Dobson, 1878:535-536). For classification of *Vampyriscus* as a subgenus of *Vampyressa*, see Peterson (1968).

Vampyressa melissa Thomas

The holotype was collected at Puca Tambo, 7100 feet, ESE of Chachapoyas, Departamento de Amazonas (Thomas, 1926a); no additional specimens have been reported.

Vampyressa pusilla (Wagner)

Little yellow-eared bats occur throughout the Amazonas. They have been recorded from San Lorenzo, 500 feet, Río Marañón, Departamento de Loreto (Thomas, 1924), to *Hacienda Cadena, near Marcapata, Departamento de Cuzco (Sanborn, 1953). *V. p. thyone* Thomas is the subspecies reported from Perú. See Goodwin (1963) for a discussion of the subspecies of *V. pusilla*.

Chiroderma trinitatum Goodwin

Distribution. Known from *Mirim, about 600 feet, *Quebrada Esperanza, Río Yavari (FMNH 89083, 89085), and *Boca Río Yaquerana, about 600 feet, *Alto Río Yavari (FMNH 89093), both localities in Departamento de Loreto, and from San Pablo.

Remarks. Three specimens from the Departamento de Loreto and one from San Pablo are the first to be reported from Perú. The only previous records are from Darién, Panamá (Handley, 1966), and Cumaca, Trinidad (Goodwin and Greenhall, 1961:258). The Peruvian specimens do not differ significantly from Trinidadian specimens with which they were compared. The lesser white-lined bat netted at San Pablo was taken in secondary vegetation at the edge of a small garden where bananas and papayas were grown.

Reproduction. 21 July: 1 non-pregnant female.

Specimen collected (1). San Pablo, 1.

Chiroderma villosum Peters

Distribution. Known from *Quistococha, near Iquitos (USNM 337940), San Lorenzo, Río Marañón (Thomas, 1927a), and Masisea, Río Ucayali (Thomas, 1928b), all three localities in Departamento de Loreto, and from San Juan.

Remarks. A single specimen was netted at San Juan over a trail in dense mature forest near a stream. The Peruvian subspecies is probably *C. v. villosum* Peters, which has been reported from Brazil to Venezuela. *C. v. jesupi* J. A. Allen is known from northern Colombia to southern Mexico (see Handley, 1960).

Reproduction. 13 August: 1 non-pregnant female.

Specimen collected (1). San Juan, 1 (USNM).

Ectophylla macconnelli (Thomas)

Distribution. Occurs throughout Amazonas; known from Santa Cecilia, Río Maniti, near Iquitos, Departamento de Loreto (FMNH 87085-87096), to Marcapata, Departamento de Cuzco (Sanborn, 1951a).

Remarks. One female was netted at the edge of a small freshly cut clearing in dense mature forest.

Reproduction. 2 August: 1 pregnant female (c-r length 14).

Specimen collected (1). San Juan, 1 (USNM).

Artibeus cinereus (Gervais)

Distribution. Recorded from Chanchamayo about 3000 feet, Departamento de Junín (Thomas, 1893), *Cerro Azul 2000 feet, near Contamana, 32 km. E Río Ucayali (Thomas, 1928b), and from Tushemo [Tushma], 1000 feet, near Masisea, Río Ucayali, both in Departamento de Loreto (Thomas, 1924). There is another record "Brazil (Río Ucayali)" (Dobson, 1878:520-521), which undoubtedly refers to the Río Ucayali, Departamento de Loreto, Perú.

I have been unable to examine two specimens from *[Puerto] Indiana, Río Amazonas, Departamento de Loreto, that were reported by Pirlot (1968) as *Artibeus nanus* Andersen, but I suspect that they represent *A. cinereus*.

Remarks. These small fruit bats were netted at San Juan along the edge of a freshly cut area in mature forest. The subspecies *A. c. glaucus* Thomas has been reported from an elevation of about 3000 feet in the Departamento de Junín (the type locality), whereas *A. c. pumilio* Thomas has been reported from the Amazonas region.

Reproduction. 25 July: 1 non-pregnant female. 5 August: 1 male (testes 4 x 3).

Specimens collected (9). San Juan, 9 (4 USNM).

Artibeus jamaicensis Leach

Distribution. Probably common throughout Amazonas. Known west of Andes from *Matapalo, Departamento de Tumbes (FMNH 81060-81061, 81063, 81066-81067), and Canchaque, Departamento de Piura (FMNH 81139), south to *Hacienda Carmen, near Motupe, Departamento de Lambayeque (FMNH 81127-81128, 81130-81136, 81138). Recorded previously east of Andes from northern and central Amazonas as follows (records from north to south): Pebas, Departamento de Loreto (Thomas, 1928c); about 32 km. WNW Moyobamba, Departamento de San Martín (Thomas, 1927a); Contamana, 500 feet, Río Ucayali (Thomas, 1928b), and Pucallpa, Río Ucayali, both in Departamento de Loreto; Agua Caliente, Río Pachitea, Departamento de Huánuco (Sanborn, 1949b).

Remarks. Specimens of the Jamaican fruit-eating bat were netted in virtually all habitats studied, but abundance in any given area seemed to be related to the amount of ripe fruit available. *A. jamaicensis* was commonly taken, for example, near papayas with ripe fruits and near fruiting wild figs at San Ramón, but individuals were netted only occasionally in virgin forest away from such food supplies. One female was netted while carrying a wild fig (about 30 mm in diameter). The status of Peruvian populations of the Jamaican fruit-eating bat is open to question.

Peruvian species of the genus *Artibeus* are widely distributed in the eastern Amazonas, and four species may be netted at a single site at San Juan. These species are easily identifiable in the field, but misidentifications have resulted from the fact that only three instead of four species have been recognized (two distinct species have been identified as *Artibeus jamaicensis*, both of which occur at San Juan and are easily distinguishable). The characters presented in Table 4 will serve to differentiate the four species of *Artibeus* that inhabit the Amazonas. Measurements for two randomly selected skulls (male and female) of the unrecognized species, followed in parenthesis by those of an adult female of *A. jamaicensis* are: greatest length, 28.0,

TABLE 4. External characteristics of Peruvian bats of the genus *Artibeus* from east of the Andes.

Characteristics	<i>A. lituratus</i>	<i>A. jamaicensis</i>	<i>A. species</i>	<i>A. cinereus</i>
Forearm length	74.3-74.8	68.6-71.1	58.3-60.1	35.2-37.3
Dorsal fur length	6-8	5-7	8-11	5-7
Eye stripes	distinct	faint	usually absent	distinct to faint
Tragus color	yellow tipped	entirely brown	dark brown to black	yellow
Dorsum color	pale reddish brown	medium grayish brown	dark brown to black	pale reddish or grayish brown
Shoulder color	paler than dorsum	much paler than dorsum	about same as dorsum	may be paler than dorsum

27.5 (31.7); depth of brain case, 10.8, 10.6 (11.5); zygomatic breadth, 17.3, 16.9 (19.6); breadth of brain case, 12.5, 12.1 (13.8); interorbital breadth, 6.9, 6.3 (7.7); length of maxillary toothrow, 10.2, 9.9 (12.0); palatal breadth, 12.9, 12.5 (14.9); postpalatal length, 8.4, 8.5 (9.7).

The smaller of the two species currently classified as *A. jamaicensis* has not been recognized in previous literature pertaining to Perú, but collections undoubtedly contain additional specimens. We collected this long furred, nearly black *Artibeus* only at San Juan, but it probably ranges widely in hilly areas bordering the eastern slopes of the Andes. Individuals of this bat were netted over trails and over a stream in mature evergreen forest. None was netted around fruit trees in Indian gardens where *A. jamaicensis* was taken much more frequently than in the forest. Eight specimens (5 USNM), not listed below, were collected at San Juan, and the following reproductive data were recorded—25 July-2 August: 3 males (testes 8 x 6, 8 x 5, 6 x 4). 16 August: 1 non-pregnant female. 26 August: 1 pregnant female (c-r length 9).

Reproduction. 28 June: 14 non-pregnant females, 15 males (testes 3 x 2 to 10 x 7, av. 5.9 x 3.8). 6 July: 2 non-pregnant females. 11-15 July: 2 non-pregnant females, 2 males (testes 8 x 7, 8 x 6). 20-21 July: 2 males (testes 7 x 5, 4 x 3). 13 August: 3 non-pregnant females.

Specimens collected (54). Nevati, 4; San Juan, 5 (USNM); San Pablo, 8; San Ramón, 37.

Artibeus lituratus (Olfers)

Distribution. Presently known only from northern and central Amazonas but probably occurring throughout most of eastern Perú. Recorded from Yurac Yacu, about 32 km. WNW Moyobamba (Thomas, 1927a) and from Moyobamba (Osgood, 1914), Departamento de San Martín, southward to Agua Caliente, Río Pachitea, Departamento de Huánuco, and Pucallpa, Río Ucayali, Departamento de Loreto (Sanborn, 1949b).

Remarks. Big fruit-eating bats were most often netted around fruit trees in the villages. Several were netted at San Juan over a stream in mature forest. Eastern Perú is the type locality for *A. l. hercules* Rehn, but Cabrera (1957:90) has suggested that this region might be an area of intergradation between *hercules* and *A. l. lituratus* (Olfers).

Reproduction. 4 July: 1 non-pregnant female, 1 male (testes 6 x 4). 18 July: 1 male (testes 10 x 8). 23 July: 1 male (testes 6 x 5). 26 July: 1 non-pregnant female, 1 male (testes 6 x 3).

Specimens collected (17). Nevati, 2; San Juan, 10 (8 USNM); San Pablo, 5.

Sphaeronycteris toxophyllum Peters

A single specimen was taken at Pebas, Río Amazonas, Departamento de Loreto (Rehn, 1900). The type locality of this bat was later restricted to Pebas by Cabrera (1957:92).

Family DESMODONTIDAE

Desmodus rotundus (É. Geoffroy St.-Hilaire)

Distribution. Most widely distributed of all Peruvian bats; recorded from at least 12 departments in and on both sides of Andes throughout entire length of Perú (de la Puente,

1951:18-19). Known from sea level on Isla de Asia (USNM 236911-236914) to elevations up to at least 11,000 feet in Andes (Thomas, 1927b).

Remarks. Large series of vampire bats were not collected because we intentionally avoided setting nets near live stock and in other situations where considerable numbers might have been taken. Vampires were common in villages, where they fed on both animals and Indians. One Campa Indian boy, about four years old, showed evidence of 14 recent bites on the top of his head where the hair had been cut short. Our observations, combined with statements of local Indians, suggested that vampires have definite preferences for one victim over another. Apparently, these bats repeatedly will seek out a single individual while bypassing those sleeping near him in the same hut. Similar observations have been made on Trinidad (Goodwin and Greenhall, 1961:268-269). The subspecies, *D. v. rotundus*, has been recorded from both sides of the Andes in Perú.

Reproduction. 28 June: 3 males (testes 7 x 4, 7 x 4, 6 x 4). 3 July: 1 non-pregnant female, 1 male (testes 7 x 5). 8 July: 1 male (testes 7 x 4). 25 July: 1 male (testes 5 x 3).

Specimens collected (10). Nevati, 2; San Juan, 1; San Pablo, 5; San Ramón, 2.

Diaemus youngi (Jentink)

This vampire bat has been reported from Pebas, 300 feet, Río Amazonas (Thomas, 1928c), and from Yarinacocha, Río Ucayali (Sanborn, 1949b), both localities in Departamento de Loreto. *D. y. cypselinus* Thomas is the subspecies on record from Perú (see Husson, 1962:198).

Diphylla ecaudata Spix

Distribution. Recorded from Puca Tambo, 5100 feet (Thomas, 1926a), and Corosha, 8000 feet (Thomas, 1926b), both in Departamento de Amazonas, Yurac Yacu, Departamento de San Martín (Thomas, 1927a), Yarinacocha, Departamento de Loreto (Sanborn, 1949b), and Tushemo [Tushma], near Masisca, Departamento de Pasco (Thomas, 1928b).

Remarks. A single specimen was netted adjacent to a place where chickens roosted at Nevati.

Specimen collected (1). Nevati, 1.

Family FURIPTERIDAE

Amorphochilus schnablii Peters

A. s. schnablii has been recorded west of the Andes from Tumbes (Peters, 1877) and Zorritos (de la Puente, 1951:22), both in Departamento de Tumbes, south to the Vitor and Tambo valleys, Departamento de Arequipa (Sanborn, 1941), and *A. s. osgoodi* J. A. Allen has been recorded east of the Andes from Balsas, 3000 feet, Departamento de Amazonas (J. A. Allen, 1914).

Furipterus horrens (F. Cuvier)

A single specimen of Cuvier's smoky bat (AMNH 98731), labeled "Peru: Río Disqui, Ucayali," is the first to be reported for the country. The Río Disqui is not shown on the American Geographical Society Map but it is assumed to be a small tributary of the well-known Río Ucayali, Departamento de Loreto. Previous records of *F. horrens* nearest Perú are from Andagada, Colombia (J. A. Allen, 1916), the Guianas (Sanborn, 1941), and Santa Catarina, Brazil (Vieira, 1942:385-386).

Family THYROPTERIDAE

Thyroptera discifera Lichtenstein and Peters

Specimens of this species have been recorded from Iquitos, 400 feet, Río Amazonas (Thomas, 1928c), and from Cumeria [Cumaria], 1000 feet, about 10° S, Río Ucayali (Thomas, 1928b), both in Departamento de Loreto. *T. d. major* Miller is the only subspecies known from South America.

Thyroptera tricolor Spix

Distribution. Probably occurs throughout Amazonas. First recorded from Marcapata, Departamento de Cuzco (Sanborn, 1951b), and now from San Juan.

Remarks. At 5:45 p.m. on 27 August, many small bats were seen flying among the tree tops in dense evergreen forest near San Juan. At 6:15 p.m. a single low-flying *T. tricolor*

struck one of the 10 five-meter nets set about every 200 feet along a trail in the forest. The only other bats taken in these nets were two *Carollia perspicillata*, but rain terminated netting at 7:00 p.m. The subspecies reported from Perú is *T. t. tricolor* Spix; however Cabrera (1957:98) stated that *T. t. albiventer* (Tomes) was probably the correct name for the Peruvian race, although both subspecies could occur in the country.

Specimen collected (1). San Juan, 1 (USNM).

Family VESPERTILIONIDAE

Myotis albescens (É. Geoffroy St.-Hilaire)

Distribution. Occurs throughout Amazonas; recorded from *Puerto Indiana, near Pebas, Río Amazonas, Departamento de Loreto (Miller and Allen, 1928:200-203), south to Marcapata, Departamento de Cuzco (Sanborn, 1951a).

Remarks. Bats of this species were most often netted near the thatched huts of Indians where they probably roosted. Many were purchased from the Indians.

Reproduction. 18 August: 10 pregnant females (c-r length 8-25, av. 15.3), 13 non-pregnant females, 3 males (testes 8 x 6, 8 x 6, 5 x 4).

Specimens collected (49). Nevati, 7; San Juan, 42 (39 USNM).

Myotis chiloensis (Waterhouse)

Little brown bats have been recorded commonly east of the Andes from Chachapoyas, 7600 feet, Departamento de Amazonas, south to the Río Inambari [Inambari], Provincia de Carabaya, Departamento de Puno (Miller and Allen, 1928:193-194). West of the Andes, they have been recorded from the Provinces of Celendín and Cutervo, Departamento de Cajamarca, south to Lima, Departamento de Lima (de la Puente, 1951:25). This species has been reported from elevations of about 1000 up to 10,500 feet. *M. c. oxyotis* (Peters) has been recorded throughout most of the Peruvian Andes, and *M. c. atacemensis* (Lataste) is the subspecies reported from the arid and semiarid regions of extreme southern Perú.

Myotis nigricans (Schinz)

Distribution. Recorded at many localities east of Andes from Moyobamba, Departamento de San Martín (Osgood, 1914), south to *Inca Mines (lat. 13° 30' S, long. 70° W), 6000 feet (J. A. Allen, 1914; Cabrera, 1957:100-101), and Provincia de Sandía (Sanborn, 1953), both in Departamento de Puno. Recorded west of Andes from Provincia de Lima, Departamento de Lima (de la Puente, 1951:28) and from Tambo Valley, Departamento de Arequipa (Sanborn, 1941).

Remarks. I netted *M. nigricans* over streams and especially around palm-thatched Indian huts. Probably they roosted in the thatching. *M. n. nigricans* (Schinz) has been recorded (Sanborn, 1949b) east of the Andes in the Amazonas region, and *M. n. nicholsoni* Sanborn has been recorded (Sanborn, 1941) west of the Andes in the arid coastal region.

Reproduction. 13-17 June: 2 pregnant females (c-r length 20, 12), 3 non-pregnant females (1 juv.). 8 July: 1 male (testes 3 x 2). 15 July: 1 male (testes 5 x 3).

Specimens collected (20). Nevati, 12; San Juan, 4; San Pablo, 3; San Ramón, 1.

Myotis simus Thomas

Distribution. Recorded previously from *Apayacu, and Orosa, Río Amazonas (Handley, 1960), Yurimaguas, Río Huallaga (Osgood, 1914), Sarayacu (Thomas, 1901), and Yarínacocha (Sanborn, 1949b), Río Ucayali (for additional records on Río Ucayali see Handley, 1960), all in Departamento de Loreto.

Remarks. Three individuals were netted over a small stream near its junction with the Río Azupizu. The Peruvian subspecies is *M. s. simus* Thomas (type locality at Sarayacu).

Reproduction. 10 August: 2 non-pregnant females.

Specimens collected (4). San Juan, 3 (2 USNM); San Pablo, 1.

Eptesicus andinus J. A. Allen

The Andean big brown bat has been recorded along the eastern slopes of the Andes from Vista Alegre, Río Chinchao, Departamento de Huánuco, and from *Maraynioc, 73 km. NE Tarma, 12,000 feet, Departamento de Junín (Davis, 1966). For a complete review of the South American species of *Eptesicus*, see Davis (1966).

Eptesicus brasiliensis (Desmarest)

Distribution. Recorded from *Montecalagre and *Puerto Indiana, Río Amazonas, Departamento de Loreto, and from Bellavista, Departamento de Cajamarca (Davis, 1966). Now known also from Nevati and San Juan.

Remarks. One male was netted at the edge of a newly cut clearing in mature forest near San Juan, and another was netted among blooming cashew trees at Nevati. A juvenile, still unable to fly, was captured in a thatched hut in Nevati. Selected measurements (see Davis, 1966) of a male from Nevati are: length of maxillary tooththrow, 6.1; third metacarpal, 40.5; forearm, 41.9; dorsal fur between the shoulders, 6-8 (preserved in alcohol). The Peruvian subspecies is *E. b. thomasi* Davis.

Reproduction. 13-17 June: 1 juv. 5 August: 1 male (testes 8 x 5).

Specimens collected (3). Nevati, 2; San Juan, 1 (USNM).

Eptesicus innoxius (Gervais)

This monotypic species has been collected from sea level to about 3000 feet along the arid coastal belt west of the Andes. The type locality is Amotape, Departamento de Piura. Specimens have been reported from Piura, 150 feet, Departamento de Piura, south to Puerto Eten, Departamento de Lambayeque (Davis, 1966).

Eptesicus montosus Thomas

Distribution. Peruvian records limited to region between San Ramón and Tarma, about 3000 feet, *Valle de Chanchamayo, Departamento de Junín (Thomas, 1893; 1920a).

Remarks. Thomas (1893) listed the locality in Chanchamayo as: "Chanchamayo, near Tarma, approximately in lat. 11° 20' S, and long. 75° 40' E," and reported that the "altitude of Chanchamayo is about 3000 feet." The Chanchamayo Valley is not shown on the maps available to me. This valley is, however, a well-known collecting site on the east side of the Andes in Central Perú; San Ramón and Tarma, where I collected mammals, are located therein. Thomas (1920a) described *Eptesicus inca* and designated "Chanchamayo, Cuzco, Peru," as its type locality. If there is a place named Chanchamayo in the Departamento de Cuzco it is unknown to the Peruvian Government. Mr. Philip Hershkovitz, Field Museum of Natural History (personal communication), who has made a thorough study of Peruvian collecting localities, believes that the *Eptesicus* labeled "Chanchamayo, Cuzco, Peru" were undoubtedly collected in Valle de Chanchamayo, Departamento de Junín, at the same place that was described by Thomas in 1893.

Comparison of Thomas' (1893, 1920a) papers indicates that the specimen reported as "*Vesperus fuscus* Palisot de Beauvois" in 1893 may have been the holotype of *Eptesicus inca* Thomas (= *E. montosus* Thomas), described in 1920. Davis (1966) listed no specimens of the genus *Eptesicus* from near Tarma.

A female was netted over a small stream in evergreen forest at the edge of a large plantation near San Ramón. Selected measurements for this specimen are: length of maxillary tooththrow, 5.8; third metacarpal, 39.7; forearm, 42.6; dorsal fur from between the shoulders, 8-11 (preserved in alcohol). The Peruvian subspecies is *E. m. chiralensis* Anthony.

Specimen collected (1). San Ramón, 1.

Histiotes macrotus (Pöppig)

This bat is known in the western slopes of the Andes from Hacienda Chucarapi, Valle de Tambo, Departamento de Arequipa, and in the Andes east of the Central Cordillera from near the south end of Lake Titicaca, Yunguyo, Departamento de Puno (Sanborn, 1941), and from Lircay, Departamento de Huancavelica (FMNH 75149). *H. m. laephotis* Thomas is the subspecies reported from Perú.

Histiotes montanus (Philippi and Landbeck)

Big-eared brown bats have been recorded from Marcapata, Departamento de Cuzco (Sanborn, 1951a), and from Segrario [Sagraria], 70° 15' W, 13° 55' S, 2200 feet, Departamento de Puno (Anthony, 1920; Sanborn, 1951a). There are also records from "Hausampilla, Peru (9,000 feet)" and "East coast of Peru" published by Dobson (1878; 189-190). Hausampilla is not shown on Peruvian maps; the specimen from the "East coast" probably came from somewhere along the eastern slope of the Andes. The subspecies recorded from Perú is *H. m. inambarus* (Anthony).

Lasiurus borealis (Müller)

Red bats have been recorded east of the Andes from Condechaca, 7000 feet, Departamento de Amazonas (Thomas, 1926a), southward to Marcapata, Departamento de Cuzco (Sanborn, 1951a), and the *Inca Mines, near Juliaca, Departamento de Puno (J. A. Allen, 1901). West of the Andes red bats have been recorded from Lima and Callao, Departamento de Lima (de la Puente, 1951:29-30). *L. b. bonariensis* (Lesson and Garnat) is the subspecies that was reported as occurring both east and west of the Andes by de la Puente (1951:30); however Handley (1960) classified the specimen from Juliaca as *L. b. frantzii* Peters, and Cabrera (1957:113) listed *L. b. varius* (Pöppig) as occurring in southern Perú. Andean races of *Lasiurus* are poorly known.

Pirlot (1968) reported a juvenile as "*Dasypterus* sp." from *[Puerto] Indiana, Río Amazonas, Departamento de Loreto. This specimen likely is *L. ega* but could be *L. borealis*.

Lasiurus cinereus (Palisot de Beauvois)

Apparently, the only Peruvian record is a single specimen collected at *Limacpuncu, about 7900 feet, near Marcapata, Departamento de Cuzco (Sanborn, 1953). The only recognized subspecies in South America is *L. c. villosissimus* (see Sanborn and Crespo, 1957).

Tomopeus rarus Miller

This monotypic species is known only from the arid coastal belt of Perú where it has been recorded from Monte Grande, 14 km. N, 25 km. E, Talara, Departamento de Piura (Davis, 1970), to Chosica, Departamento de Lima (Miller, 1900b). The type locality is *Yayan, about 3080 feet, Departamento de Cajamarca. Davis (1970) has summarized the records of occurrence of this bat.

Family MOLOSSIDAE

Molossops brachymeles (Peters)

The holotype was obtained from an unspecified locality in Perú (Peters, 1865), but no additional specimens have been reported from the country.

Molossops milleri Osgood

A single specimen, the holotype, was obtained at Yurimaguas, 600 feet, Río Huallaga, Departamento de Loreto (Osgood, 1914).

Molossops temminckii (Burmeister)

Distribution. Known only from San Juan, but probably occurs elsewhere in eastern Perú.

Remarks. Two specimens collected at San Juan, which provide the first Peruvian records for this bat, were netted along the edge of newly cut mature forest on the south side of the village. About two acres of large trees had been cut only a few hours earlier, and an unusually large number of insects were flying in the area. At dusk, approximately 30-40 small molossids were foraging over the cleared area, but most were flying too high to be netted.

M. t. griseiventer Sanborn has been reported from the Departamento de Tolima, Colombia (Sanborn, 1941). The taxonomic status of Peruvian specimens is uncertain.

Reproduction. 5 August: 2 pregnant females (c-r lengths both 20).

Specimens collected (2). San Juan, 2 (USNM).

Tadarida brasiliensis (I. Geoffroy St.-Hilaire)

Brazilian free-tailed bats occur throughout most of Perú, from near sea level to elevations of at least 6000 feet in the Andes at Machu Picchu, Departamento de Cuzco (Thomas, 1920b). The species has been recorded east of the Andes from the Provincia de San Martín, Departamento de San Martín (Jamet and Vasquez, 1957), southward to the Provincia de Sandia, Departamento de Puno, and west of the Andes from Departamento de Lima, south to Arequipa, Departamento de Arequipa (de la Puente, 1951:35). According to de la Torre (1956), *Mormopterus peruana* J. A. Allen is a synonym of *Tadarida brasiliensis*. The Peruvian subspecies is probably *T. b. brasiliensis* (I. Geoffroy), but the status of *T. brasiliensis* in Perú is open to question.

Tadarida macrotis (Gray)

The only known Peruvian specimens are from near Marcapata, Departamento de Cuzco (Sanborn, 1951a).

Tadarida similis Sanborn

This bat has been recorded east of the Andes from near Marcapata, Departamento de Cuzco (Sanborn, 1951a), and west of the Andes from the Provincia de Lima, Departamento de Lima (de la Puente, 1951:38).

Mormopterus kalinowskii (Thomas)

Kalinowski's bat is known west of the Andes from Trujillo, Departamento de La Libertad (USNM 283175 and AMNH 165625-165627), and from Chosica, 2800 feet, Departamento de Lima (USNM 103928): from east of the Andes it has been recorded from *Hacienda Limon, near Balsas, Río Marañón, Departamento de Amazonas (Osgood, 1914). The locality given for the holotype was "Central Peru" (Thomas, 1893).

Mormopterus phrudus Handley

Two individuals from the type locality at Machu Picchu, 6000 feet, Departamento de Cuzco, are the only specimens known (Handley, 1956).

Molossus ater É. Geoffroy St.-Hilaire

Black mastiff bats have been recorded from Shapaja and Juan Guerra, Departamento de San Martín (Jamet and Vasquez, 1957), and from Tingo Maria, 2000 feet, Río Huallaga, Departamento de Huánuco, south to near Marcapata, Departamento de Cuzco (Sanborn, 1951a). *M. ater* also has been reported (under the name *M. mysurus*) from the "region of Ceja, 5000 feet above sea level on the eastern slopes of the Central Cordillera" (Tschudi, 1844:85). The only Ceja that I have been able to locate in Perú is on the western slope of the Cordillera, about 3000 feet, Departamento de Arequipa. For the use of *M. ater* in place of *M. rufus* see Goodwin (1960).

Molossus molossus (Pallas)

Distribution. Occurs throughout most of Perú from sea level to 9000 feet in Andes (Dobson, 1878:412). Recorded east of Andes from Pebas, Río Amazonas, Departamento de Loreto (Thomas, 1928c), south to near Marcapata, Departamento de Cuzco (Sanborn, 1951a), and west of Andes from Piura, Departamento de Piura (Miller, 1913), and Eten, Departamento de Lambayeque (USNM 155538-155543).

Remarks. See Husson (1962:256-258) for the correct specific name of this bat. Free-tailed bats were netted among huts at Nevati and appeared to be emerging from palm-thatched roofs. The subspecies reported from west of the Andes is *M. m. daulensis* J. A. Allen (Allen, 1965). *M. m. crassicaudatus* É. Geoffroy St.-Hilaire has been reported from the Guayanas south to Argentina, and *M. m. major* (Kerr) has been reported from Colombia and Venezuela. Dr. Karl F. Koopman has kindly examined a large number of small *Molossus* represented by specimens from Panamá to Guayana and Argentina, and he tentatively recognized *M. m. daulensis* J. A. Allen from northwestern Perú and *M. m. crassicaudatus* from the Amazon basin of Perú.

Specimens collected (7). Nevati, 7.

Promops davisoni Thomas

This bat is known west of the Andes from Talara, Departamento de Piura, south to Barranco, Chosica (type locality), Matucana, and Miraflores, all in Departamento de Lima (de la Puente, 1951:39-40).

Eumops auripendulus (Shaw)

Temminck's mastiff bat has been recorded west of the Andes from *Mallares Provincia de Sullana, Departamento de Piura (Aellen, 1965), and east of the Andes from Guayabamba (=Santa Rosa de Huayabamba), Departamento de San Martín (J. A. Allen, 1897; Goodwin, 1953:259), Pucallpa, Río Ucayali, Departamento de Loreto (Sanborn, 1949b), and from Vista Alegre and Hacienda San Antonio, Río Chinchao, both in Departamento de Huánuco, southward to the Colonia del Pereni [Perene], Departamento de Junín (Sanborn, 1932b).

These records include specimens previously reported as *Eumops abrasus* (see Goodwin, 1960). Two subspecies have been reported from Perú, *E. a. auripendulus* (Shaw) to the west of the Andes and *E. a. milleri* (Allen) to the east.

Eumops perotis (Schinz)

The greater mastiff bat is known west of the Andes from the Provincia de Lima, Departamento de Lima (de la Puente, 1951:42), and east of the Andes from Juan Guerra, Río Ponasa [Ponaza], and *Rumispá, both in Departamento de San Martín (Jamet and Vasquez, 1957), and from the Departamento de Loreto (no exact locality—Sanborn, 1932*b*). Sanborn's record from Loreto substantiates the occurrence of *E. p. perotis* (Schinz) east of the Andes, but it is possible that the specimens cited by Jamet and Vasquez represent misidentified *Eumops trumbulli*. The specimens reported by de la Puente (1951) as *E. p. californicus* from the west coast of Perú are instead *E. p. perotis* (see Smith and Genoways, 1969).

Eumops trumbulli (Thomas)

The only Peruvian localities of record for this bat are Yarinacocha, Río Ucayali, and Alto Río Nanay (Sanborn, 1932*b*) both in Departamento de Loreto (Sanborn, 1949*b*). Fifteen specimens reported from *[Puerto] Indiana, Río Amazonas, Departamento de Loreto as *Eumops perotis* (Pirlot, 1968) probably represent additional records of *Eumops trumbulli* according to Smith and Genoways (1969).

SPECIES ERRONEOUSLY REPORTED FROM PERU

Cabrera (1957:67) and more recent authors have listed *Phyllostomus discolor* (Wagner) as occurring in Perú. Apparently, the only Peruvian record is based on *Phyllostoma innominatum* Tschudi (1844:62). Tschudi noted that he had not examined specimens and that he was applying the name *innominatum* (literally meaning unnamed) to a bat described by Pöppig (1832). Pöppig reported that he had found a new kind of *Phyllostoma* that changed the number of teeth with age and showed great variation in coat color. Pöppig's description indicates that his series probably included several different genera. Thus the name *P. innominatum*, designated by Tschudi, is a *nomen dubium*, based on a composite. *P. discolor* probably ranges into eastern Perú, but no valid records are known to me.

If Tschudi (1844:74-75) correctly described a Peruvian bat, listed as *Vespertilio velatus* Fischer, it could not, according to Peters (1875), have been the bat now known as a synonym of *Histiotus velatus* (L. Geoffroy St.-Hilaire). Apparently, there are no valid records of *H. velatus* for Perú.

LIST OF COLLECTING STATIONS, 1963-64

Nevati

Departamento de Pasco, Provincia de Oxapampa, 900 feet, *Nevati, latitude 10° 21' N, longitude 74° 51' W.

Dates of collecting. 15-18 June 1963, 2-28 July 1964.

Habitat. Nevati is a mission station surrounded by a village of about 250 Campa Indian inhabitants. It is located on the north bank of the Río Pichis, about 10 km. SE Puerto Bermudez. The surrounding land is undulating and the virgin evergreen forest is 60-120 feet tall. Netting was done among the palm thatched huts of the village, among flowering cashew trees, and in nearby gardens where bananas were grown.

San Pablo

Departamento de Pasco, Provincia de Oxapampa, 900 feet, *San Pablo, latitude 10° 27' N, longitude 74° 52' W.

Dates of collecting. 2-22 July 1964.

Habitat. San Pablo is a Campa Indian village of about 175 inhabitants located in undulating country on the east bank of the Río Azupizu. Most netting was done in or near the village. Netting in the virgin evergreen forest was poor except for a single area about a kilometer east of the village where there were large rubber trees. At that place most of the low vegetation had been cleared away by the Indians who harvested rubber. The most successful netting was done in small gardens where bananas, papayas, and other fruits were grown.

San Juan

Departamento de Pasco, Provincia de Oxapampa, 900 feet, *San Juan, latitude 10° 30' N, longitude 74° 53' W.

Dates of collecting. 22 July-29 August 1964.

Habitat. San Juan is a Campa Indian village, population about 75, located on the east bank of the Río Azupizu about 5 km. from San Pablo. Immediately behind the village to the southeast is a sharply rising hill that reaches an elevation of about 2000 feet. Beyond, the country becomes rugged, with large hills and many cliffs. San Juan is surrounded by virgin evergreen forest 60-120 feet tall. Most netting was done at the southwest end of the village where the Indians were clearing the forest to extend a landing strip used by mission planes. Bat netting always seemed to improve considerably immediately following additional clearing. Nets set across a shallow stream and in the forest across a 15-foot-wide trail south of the village also were productive. Many bats collected near San Juan were shot from their day roosts within a 6-kilometer radius of the village.

San Ramón

Departamento de Junín, Provincia de Tarma, 2900 feet, 3 km. NW San Ramón, latitude 11° 8' N, longitude 75° 22' W.

Dates of collecting. 25-29 June 1964.

Habitat. Netting was done over a stream that varied from 10-20 feet in width, over a trail above the stream in dense secondary growth, and along the lower edge of a plantation between the stream and a small sawmill. Many bats netted over the trail had been attracted to the area by several large fig trees (*Ficus*) with ripe fruit. Nets set along the lower edge of the plantation were near ripe papayas.

Tarma

Departamento de Junín, Provincia de Tarma, 7300-7900 feet, 32-35 km. NE Tarma, latitude 11° 14' N, longitude 75° 29' W.

Dates of collecting. 17-24 June 1964.

Habitat. Netting was done near and over a stream 12-15 feet wide at places 600-800 feet from where it joined the Río Palca. Nearly vertical canyon walls extended upwards on both sides of the stream valley for more than 1000 feet. Brushy forest (10-35 feet tall) bordered the stream, giving way to scattered shrubs, grass and rocky cliffs within 150 feet. Most of the *Anoura* were shot in a tunnel used by a large power plant at 7900 feet, 32 km. NE Tarma. All other specimens were netted at 7300 feet, 35 km. NE Tarma.

LITERATURE CITED

- AELLEN, V. 1965. Sur une petite collection de Chiropteres du nord-ouest du Perou. *Mammalia* 29:563-571, 1 pl., December.
- ALLEN, G. M. 1908. Notes on Chiroptera. *Bull. Mus. Comp. Zool.* 52:25-63, 1 pl., July.
- ALLEN, J. A. 1897. On a small collection of mammals from Peru, with descriptions of new species. *Bull. Amer. Mus. Nat. Hist.* 9:115-119, April 26.
- . 1901. On a further collection of mammals from southeastern Peru, collected by Mr. H. H. Keays, with descriptions of new species. *Bull. Amer. Mus. Nat. Hist.* 14:41-46, January 31.
- . 1914. New South American bats and a new octodont. *Bull. Amer. Mus. Nat. Hist.* 33:381-389, 1 pl., July 9.
- . 1916. List of mammals collected in Colombia by the American Museum of Natural History Expeditions, 1910-1915. *Bull. Amer. Mus. Nat. Hist.* 35:191-238, 1 map, May 31.
- ANDERSEN, K. 1906. On the bats of the genera *Micronycteris* and *Glyphonycteris*. *Ann. Mag. Nat. Hist. ser. 7*, 18:50-65, July.
- ANTHONY, H. E. 1920. New rodents and new bats from Neotropical Regions. *Jour. Mamm.* 1:85-86, March 2.
- . 1923. Preliminary report on Ecuadorian mammals. No. 3. *Amer. Mus. Novit.* 55: 1-14, 4 figs., January 31.
- BOSWORTH, T. O. 1922. *Geology and Paleontology of North-West Peru.* Macmillan and Co., London, xvii+434 pp., 150 figs., 24 pls., 10 foldouts.

- BOWMAN, I. 1916. The Andes of Southern Peru: Geographical Reconnaissance along the Seventy-Third Meridian. H. Holt and Co., New York, xi+336 pp., 204 figs., 9 foldouts.
- CABRERA, A. 1958. Catalogo de los mamíferos de America del Sur. Rev. Mus. Argentino Cien. Nat. "Bernardino Rivadavia," Cien. Zool. 4:xxii+1-307, 1 pl.
- CARTER, D. C. 1966. A new species of *Rhinophyllia [sic]* (Mammalia, Chiroptera, Phyllostomidae) from South America. Proc. Biol. Soc. Washington 79:235-238, 1 fig., December 1.
- . 1968. A new species of *Anoura* (Mammalia: Chiroptera: Phyllostomidae) from South America. Proc. Biol. Soc. Washington 81:427-430, December 30.
- CHAPMAN, F. M. 1926. The distribution of bird life in Ecuador, a contribution to the study of the origin of Andean bird-life. Bull. Amer. Mus. Nat. Hist. 55:ii+1-784, 30 pls., 20 figs.
- DAVIS, W. B. 1966. Review of South American bats of the genus *Eptesicus*. Southwestern Nat. 11:245-274, 5 figs., June 30.
- . 1968. Review of the genus *Uroderma* (Chiroptera). Jour. Mamm. 49:676-698, 9 figs., November 26.
- . 1970. *Tomopeas rarus* Miller (Chiroptera). Jour. Mamm. 50:244-247, 2 figs., May 20.
- DE LA TORRE, L. 1956. The status of *Mormopterus peruanus* J. A. Allen. Proc. Biol. Soc. Washington 69:187-188, December 31.
- . 1966. New bats of the genus *Sturnira* (Phyllostomidae) from the Amazonian lowlands of Peru and the Windward Islands, West Indies. Proc. Biol. Soc. Washington 79:267-272, 6 figs., December 1.
- DE LA PUENTE, J. O. 1951. Estudio monografico de los quiropteros de Lima y alrededores. Publ. Mus. Hist. Nat. "Javier Prado," Univ. Nac. Mayor de San Marcos, ser. A. Zool. 7:1-48, 9 pls., December.
- DOBSON, G. E. 1878. Catalogue of the Chiroptera . . . in the British Museum. London, xlii+567 pp., 30 pls.
- DOUGLAS, J. A. 1933. The geology of the Marcapata Valley in eastern Peru. Quart. Jour. Geol. Soc. London 89:308-356, 5 figs., 33 pls., December 7.
- FENNER, C. N. 1948. Pleistocene climate and topography of the Arequipa Region, Peru. Bull. Geol. Soc. Amer. 59:895-917, 5 pls., September.
- GARDNER, A. L., and J. P. O'NEILL. 1969. The taxonomic status of *Sturnira bidens* (Chiropteres Phyllostomidae) with notes on its karyotype and life history. Occas. Papers Mus. Louisiana State Univ. 38:1-8, March 26.
- GARNER, H. E. 1959. Stratigraphic-sedimentary significance of contemporary climate and relief in four regions of the Andes Mountains. Bull. Geol. Soc. Amer. 70:1327-1368, 20 figs., October.
- GOODWIN, G. G. 1942. A summary of recognizable species of *Tonatia* with descriptions of two new species. Jour. Mamm. 23:204-209, May 14.
- . 1953. Catalogue of type specimens of recent mammals in the American Museum of Natural History. Bull. Amer. Mus. Nat. Hist. 102:207-412, August 31.
- . 1960. The status of *Vespertilio auripendulus* Shaw, 1800, and *Molossus ater* Geoffroy, 1805. Amer. Mus. Novit. 1994:1-6, 1 fig., March 8.
- . 1963. American bats of the genus *Vampyressa*, with the description of a new species. Amer. Mus. Novit. 2125:1-24, 14 figs., April 5.
- GOODWIN, G. G., and A. M. GREENHALL. 1961. A review of the bats of Trinidad and Tobago. Bull. Amer. Mus. Nat. Hist. 122:187-302, 113 figs., 39 pls., 2 maps, June 26.
- HAFFER, J. 1967a. Zoogeographical notes on the nonforest lowland bird faunas of northwestern South America. El Hornero 10:315-333, 2 figs.
- . 1967b. On the dispersal of highland birds in tropical South and Central America. El Hornero 10:436-438.
- . 1967c. Some allopatric species pairs of birds in northwestern Colombia. Auk 84:343-365, 6 figs., July 31.
- . 1968. Über die Entstehung der nördlichen Anden und das vermutliche Alter columbianischer Vogelarten. Jour. Ornithologie 109:67-69.
- HALL, E. R., and K. R. KELSON. 1959. The Mammals of North America. The Ronald Press Co., New York, 1:xxviii+1-546+79 pp., illustrated, March 31.

- HANDLEY, C. O., JR. 1956. A new species of free-tailed bat (genus *Mormopterus*) from Peru. Proc. Biol. Soc. Washington 69:197-202, December 31.
- . 1960. Descriptions of new bats from Panama. Proc. U.S. Nat. Mus. 112:459-479, October 6.
- . 1966a. Descriptions of new bats (*Choeroniscus* and *Rhinophylla*) from Colombia. Proc. Biol. Soc. Washington 79:83-88, May 23.
- . 1966b. Checklist of mammals of Panama. In Ectoparasites of Panama. (Wenzel, R. L., and V. J. Tipton, eds.), pp. 753-795. Field Mus. Nat. Hist., November 22.
- HARRISON, J. V. 1943. The geology of the central Andes in part of the Province of Junin, Peru. Quart. Jour. Geol. Soc. London 99:1-36, 18 figs., 7 pls., July 20.
- HERSHKOVITZ, P. 1949. Mammals of northern Colombia. Preliminary report No. 5: Bats (Chiroptera). Proc. U.S. Nat. Mus. 99:429-454, 1 map, May 10.
- HILL, J. E. 1964. Notes on bats from British Guiana, with the description of a new genus and species of Phyllostomidae. Mammalia 28:553-572, 3 figs., December.
- HUSSON, A. M. 1962. The Bats of Suriname. Rijksmuseum Nat. Hist., Leiden, 282 pp., 39 figs., 30 pls., November 28.
- JAMET, P. A., and J. Z. VASQUEZ. 1957. Estudio en quiropteros de la region de San Martín (Perú) como probables reservorios de rabia. Bol. Oficina Panamericana 42:211-222, 5 pls., 1 map, March.
- JOHNSON, G. R., and R. R. PLATT. 1930. Peru from the air. Spec. Publ. Amer. Geog. Soc. 12: vii+159, 152 figs.
- JONES, J. K., JR. 1966. Bats from Guatemala. Univ. of Kansas Publ., Mus. Nat. Hist. 16: 439-472, April 18.
- KENDREW, W. G. 1953. The Climates of the Continents. Oxford Univ. Press, London, 4th ed., 608 pp., 194 figs.
- LEMON, R. H., and C. S. CHURCHER. 1961. Pleistocene geology and paleontology in northwest Peru. Amer. Jour. Sci. 259:410-429, 1 fig., June.
- MCLAUGHLIN, D. H. 1924. Geology and physiography of the Peruvian Cordillera, Departments of Junin and Lima. Bull. Geol. Soc. Amer. 35:591-632, 8 figs., April.
- MILLER, G. S., JR. 1900a. A bat of the genus *Lichonycteris* in South America. Proc. Biol. Soc. Washington 13:156, June 13.
- . 1900b. A new bat from Peru. Ann. Mag. Nat. Hist. ser. 7, 6:571-574, December.
- . 1913. Notes on the bats of the genus *Molossus*. Proc. U.S. Nat. Mus. 46:85-92, August 23.
- , and G. M. ALLEN. 1928. The American bats of the genera *Myotis* and *Pisonyx*. Bull. U.S. Nat. Mus. 144:vii+218, 1 fig., 1 pl., 13 maps, May 25.
- OGILVIE, A. G. 1922. Geography of the central Andes. Amer. Geog. Soc., New York, xi+240 pp., 41 figs., 1 pl.
- OSGOOD, W. H. 1914. Mammals of an expedition across northern Peru. Field Mus. Nat. Hist., Zool. Ser. 10:143-185, April 20.
- PETERS, W. 1865. [Über die brasilianischen, von Spix beschriebenen Flederthiere.] Monatsber. k. preuss. Akad. Wiss., Berlin, pp. 568-588, 4 figs.
- . 1872. [Über den *Vespertilio calcaratus* Prinz zu Wied und eine neue Gattung de Flederthiere, *Tylonycteris*.] Monatsber. k. preuss. Akad. Wiss., Berlin, pp. 699-706.
- . 1875. [Über die mit *Histiotus velatus* verwandten Flederthiere aus Chile.] Monatsber. k. preuss. Akad. Wiss., Berlin, pp. 785-792, 5 figs.
- . 1877. [Über eine neue Gattung von Flederthieren, *Amorphochilus*, aus Peru. . . .] Monatsber. k. preuss. Akad. Wiss., Berlin, pp. 184-188, 1 fig.
- . 1880. [Über neue Flederthiere (*Vesperus*, *Vampyrops*).] Monatsber. k. preuss. Akad. Wiss., Berlin, pp. 257-259, 2 figs.
- PETERSON, R. L. 1968. A new bat of the genus *Vampyressa* from Guayana, South America. Contrib. Royal Ontario Mus. 73:1-17, 6 figs., September.
- PIRLOT, P. 1968. Chiropteres du Perou, specialment de Haute-Amazone. Mammalia 32:86-95, 2 figs., March.
- PÖPPIG, E. F. 1832. [Title unknown.] Notizen aus dem Gebeite der Natur und Heilkunde 33:148-150, April.

- REHN, J. A. G. 1900. Notes on Chiroptera. Proc. Acad. Nat. Sci. Philadelphia, pp. 755-759, February 9.
- SANBORN, C. C. 1932*a*. Neotropical bats in the Carnegie Museum. Annals Carnegie Mus. 21:171-183, September 15.
- . 1932*b*. The bats of the genus *Eumops*. Jour. Mamm. 13:347-357, November 2.
- . 1933. Bats of the genera *Anoura* and *Lonchoglossa*. Field Mus. Nat. Hist. Zool. Ser. 20:24-27, December 11.
- . 1936. Records and measurements of Neotropical bats. Field Mus. Nat. Hist. Zool. Ser. 20:93-106, August 15.
- . 1937. American bats of the subfamily Emballonurinae. Field Mus. Nat. Hist. Zool. Ser. 20:321-354, 11 figs., December 28.
- . 1941. Descriptions and records of Neotropical bats. Field Mus. Nat. Hist. Zool. Ser. 27:371-385, December 8.
- . 1949*a*. Bats of the genus *Micronycteris* and its subgenera. Fieldiana-Zool. 31:215-233, 9 figs., April 29.
- . 1949*b*. Mammals from the Rio Ucayali, Peru. Jour. Mamm. 30:277-288, 1 map, August 17.
- . 1951*a*. Mammals from Marcapata, southeastern Peru. Publ. Mus. Hist. Nat. "Javier Prado," ser. A, Zool. 6:1-26, October.
- . 1951*b*. Two new mammals from southern Peru. Fieldiana-Zool. 31:473-477, 2 figs., February 23.
- . 1953. Mammals from the Departments of Cuzco and Puno, Peru. Publ. Mus. Hist. Nat. "Javier Prado," ser. A, Zool. 12:1-8, November.
- . 1955. Remarks on the bats of the genus *Vampyrops*. Fieldiana-Zool. 37:403-413, June 19.
- , and J. A. CRESPO. 1957. El murcielago blanquizco (*Lasiurus cinereus*) y sus subespecies. Bol. Mus. Argentino Ciencias Naturales "Bernardino Rivadavia" 4:1-13.
- SCHMIDT, K. P., and W. F. WALKER, JR. 1943. Snakes of the Peruvian coastal region. Field Mus. Nat. Hist., Zool. Ser. 24:297-324, 1 fig., October 20.
- SMITH, J., and H. GENOWAYS. 1969. Systematic status of the mastiff bat, *Eumops perotis renatae* Pirlot, 1965. Mammalia 33:529-533, 1 fig.
- THOMAS, O. 1893. On some mammals from central Peru. Proc. Zool. Soc. London, pp. 333-340, 2 pls., April 7.
- . 1901. New *Myotis*, *Artibeus*, *Sylvilagus*, and *Metachirus* from Central and South America. Ann. Mag. Nat. Hist. ser. 7, 7:541-545, June.
- . 1912. New bats and rodents from South America. Ann. Mag. Nat. Hist. ser. 8, 10:403-411, October.
- . 1913*a*. On some rare Amazonian mammals from the collection of the Para Museum. Ann. Mag. Nat. Hist. ser. 8, 11:130-136, January.
- . 1913*b*. A new genus of Glossophagine bat from Colombia. Ann. Mag. Nat. Hist. ser. 8, 12:270-271, September.
- . 1915. A new genus of phyllostome bats and a new *Rhipidomys* from Ecuador. Ann. Mag. Nat. Hist. ser. 8, 16:310-312, October.
- . 1920*a*. On Neotropical bats of the genus *Eptesicus*. Ann. Mag. Nat. Hist. ser. 9, 5:360-367, April.
- . 1920*b*. Report on the mammalia collected by Mr. Edmund Heller during the Peruvian Expedition of 1915 under the auspices of Yale University and the National Geographic Society. Proc. U.S. Nat. Mus. 58:217-250, 1 pl., November 10.
- . 1921. A new bat of the genus *Promops* from Peru. Ann. Mag. Nat. Hist. ser. 9, 8:139, July.
- . 1924. On a collection of mammals made by Mr. Latham Rutter in the Peruvian Amazonas. Ann. Mag. Nat. Hist. ser. 9, 13:530-538, May.
- . 1926*a*. The Godman-Thomas expedition to Peru—III. On mammals collected by Mr. R. W. Hende in the Chachapoyas Region of north Peru. Ann. Mag. Nat. Hist. ser. 9, 18:156-157, July.
- . 1926*b*. The Godman-Thomas expedition to Peru—IV. On mammals collected by Mr.

- R. W. Hendece north of Chachapoyas, Province of Amazonas, north Peru. *Ann. Mag. Nat. Hist.* ser. 9, 18:345-349, September.
- . 1927*a*. The Godman-Thomas expedition to Peru—V. On mammals collected by Mr. R. W. Hendece in the Province of San Martin, N. Peru, mostly at Yurac Yacu. *Ann. Mag. Nat. Hist.* ser. 9, 19:361-375, March.
- . 1927*b*. The Godman-Thomas expedition to Peru—VI. On mammals from the Upper Huallaga and neighboring Highlands. *Ann. Mag. Nat. Hist.* ser. 9, 20:594-609, November.
- . 1928*a*. A new genus and species of glossophagine bat, with a subdivision of the genus *Choeronycteris*. *Ann. Mag. Nat. Hist.* ser. 10, 1:120-123.
- . 1928*b*. The Godman-Thomas expedition to Peru—VII. The mammals of the Rio Ucayali. *Ann. Mag. Nat. Hist.* ser. 10, 2:249-265, September.
- . 1928*c*. The Godman-Thomas expedition to Peru—VIII. *Ann. Mag. Nat. Hist.* ser. 10, 2:285-294, September.
- TOSI, J. A., JR. 1960. Zonas de vida natural en el Perú. Publ. Instituto Interamericano de Ciencias Agrícolas de la OEA Zona Andina, Bol. Técnico 5:vi+1-271, 78 figs.
- TSCHUDI, J. J. VON. 1844. Therologie, *in* Untersuchungen über die Fauna Peruana. St. Gallen, pt. I, pp. 1-262, 18 pls.
- VIEIRA, C. O. DA CUNHA. 1942. Ensaio monographico sobre os Quiropteros do Brasil. *Arq. Zool. Est. Sao Paulo* 3:219-471, 42 figs., 4 pls.
- VILLA-R., B., and M. VILLA CORNEJO. 1969. Algunos murciélagos del norte de Argentina. *Misc. Publ. Mus. Nat. Hist. Univ. Kansas* 51:407-428, 2 figs., July 11.
- WORLD WEATHER RECORDS. 1966. World Weather Records, 1951-1960. vol. 3, South America, Central America, West Indies, the Caribbean, and Bermuda. U.S. Dept. Commerce, Environmental Science Service Administration, Washington, D.C., pp. 1-355.